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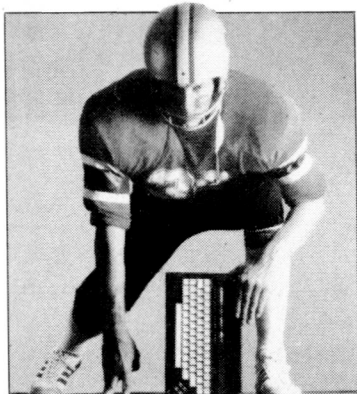
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# CONTENTS

Vol 7 No 10 October 1984



Cover photograph by Crispin Thomas

## REGULARS

### NEWSPRINT

86

Everybody's doing it (launching new micros, that is). Guy Kewney keeps track.

### SUBSCRIPTIONS

96

Our cover price may have gone up but the cost of subscribing stays the same.

### YANKEE DOODLES

107

Apple may have more tricks up its sleeve for the Macintosh — our man in the States plays his cards.

### ORIENT EXPRESS

109

The MSX bandwagon keeps on rolling — our Tokyo correspondent hitches a ride.

### NETWORKS

110

Peter Tootill continues to explore the world of networking.

### COMMUNICATIONS

114

Readers take their revenge on the micro industry, plus our bludners.



### BANKS' STATEMENT

118

Fancy an intellectual conversation for breakfast? Our Martin pushes his cornflakes aside to ponder the possibilities for molecular electronics.

### SCREENPLAY

128

Tony Hetherington survives D-Day to bring in the best of the recent games.

### BIBLIOFILE

194

Looking for advice on the best books to buy? David Taylor lends a helping hand.

### MICROCHESS

196

The saga of men versus machine continues.

### TJ'S WORKSHOP

198

What the manuals forgot to tell you — our selection of hints and tips on making the most of your micro.

### COMPUTER ANSWERS

202

Your technical questions answered, courtesy of Tony Hetherington.

### SUBSET

204

Machine code routines to simplify assembly language programming.

### NUMBERS

214

Mike Mudge presents his latest medley

### LEISURE LINES

214

JJ Clessa's monthly brainteaser

### DIRECT ACCESS

215

Latest news from the clubs, plus Transaction File, Diary Data, Writing for PCW and details of our Benchmarks.

### PROGRAM FILE

220

The best games, utilities and business software, ready to type in and use.

### BACK ISSUES

246

Details of the ones that got away.

### ADVERTISERS' INDEX

367

### PRIZE CROSSWORD

368

### CHIPCHAT

368

Who's got two number 9s on its portable, and no number 1? Twist our arms and we'll tell you.

Founder Angelo Zgorelec Editor Graham Cunningham Features Editor Jerry Sanders Production Editor Ginny Conran Sub Editor Lauraine Danker Home Computing Editor Tony Hetherington Business Computing Editor Peter Bright Staff Writer Nick Walker Consultant Editors David Tebbutt, Dick Pountain Editorial Secretary Tracy Dear Group Art Director Jim Dansie Art Editor Peter Green Assistant Art Editor Paul Ballard Typesetters Meadway Graphics 198 Victoria Road Romford Essex Group Publisher John Cade Publisher Tony Harris Group Advertisement Manager Peter Goldstein Advertisement Manager Bettina Williams Assistant Advertisement Managers Sarah Baron, Philip Pratt Senior Sales Executive Laura Cade, Claire Rowbottom Sales Executives Claire Barnes, Phil Benson, Mike Blackman, Paul Evans, Tony Keefe, Christian McCarthy, Amanda Moore, Sarah Musgrave, Tony O'Reilly Advertisement Assistant Julia Vale Advertisement Production Jeska Harrington Production Assistant Bev Grice



# BENCHTESTS & REVIEWS



## COMMODORE PLUS/4 120

Commodore 64s are reported to be outselling Spectrums these days, but how will the Plus/4 fare against the likes of the QL? Tony Hetherington's exclusive Benchtest provides the answers.

## PENPAD 144

Throw away your keyboard and pick up a Penpad—a digitiser tablet plus pen, among other things, all powered by Motorola's 68000 chip.

## PORTMAN MODEM 146

Single-standard modems are being replaced by their multi-standard rivals which provide access to a range of facilities. One of the latest to be given BT approval is Interlekt's Portman—Peter Tootill puts it through its paces.

## A DIFFERENT ASPECT 148

Kathy Lang takes in the view from Aspect, a database package running on a range of 16-bit machines.

## APRICOT F1

152

There's a new baby in the Apricot family—christened the F1, for First One. Peter Bright assesses the attractions of 16-bit colour computing for less than £1000.



## MEMOTECH RS128 168

Another expanding family: the Memotech 500's 'big brother' has arrived, with, as its name suggests, an RS232 communications board and 128k of RAM. Tony Hetherington gets to grips with the enhancements.

## LESSON IN LOGO 174

There's more to Logo than turtle graphics, as Mike Liardet proves in his review of the Spectrum version of the language.

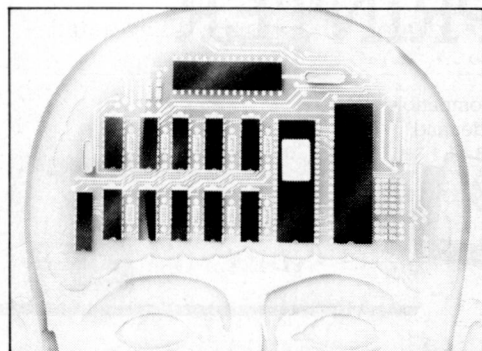
## STRAIGHT XCHANGE 180

The application software that first appeared on the QL has now been enhanced to run on 16-bit machines, bringing it into competition with such heavyweights as Symphony and Framework. Peter Bright referees the contest.

# FEATURES

## ONE STEP AT A TIME 132

Debugging Spectrum programs is as easy in assembler as Basic, using this single-stepping monitor.



## MIND OVER MATTER 136

How close is artificial intelligence to matching the brain's processing powers?

## A FRIENDLY APPROACH 141

Pete Gerrard offers advice on improving your Commodore 64 programming skills.

## EUREKA! 160

Programming problems solved, courtesy of compilers—Ric Wickham explains how they work and how to buy the best.

## THE MISSING LINK 187

Modular programming has a lot to offer, but it can be difficult selecting the addresses for each module and then linking them. JL Gordon explains how to set about it.

## TEACH YOURSELF LISP 190

Recursion is a hard concept to master, but the rewards more than repay the effort, as Dick Pountain explains.

## TIME FOR THE SHOW-DOWN 206

The curtain rises on the UK's biggest micro show.

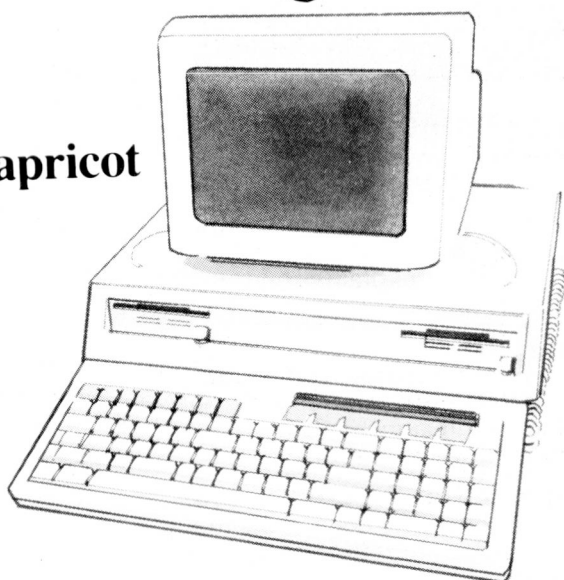


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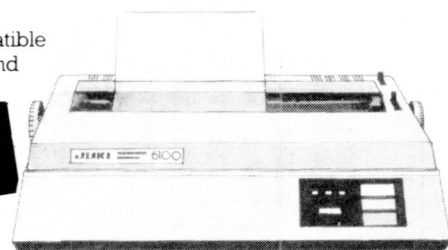
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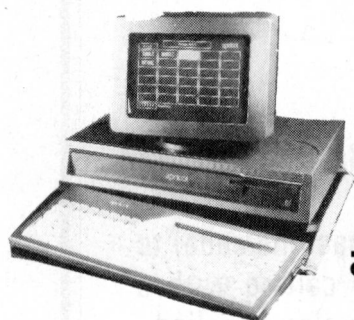
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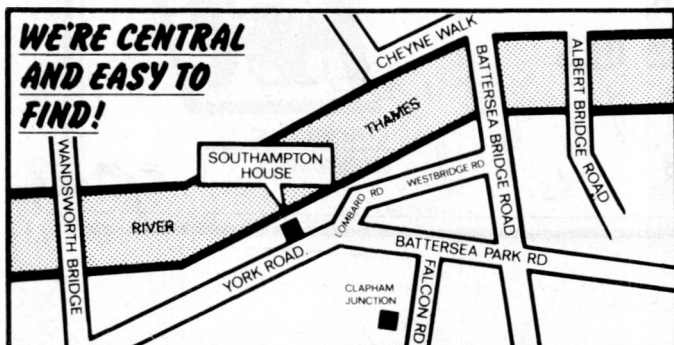
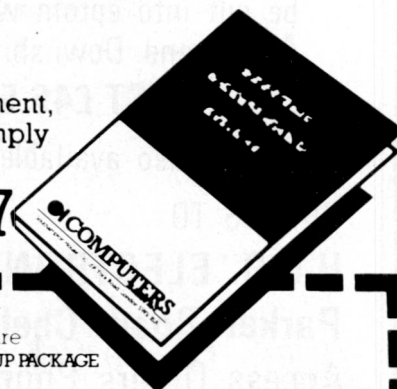
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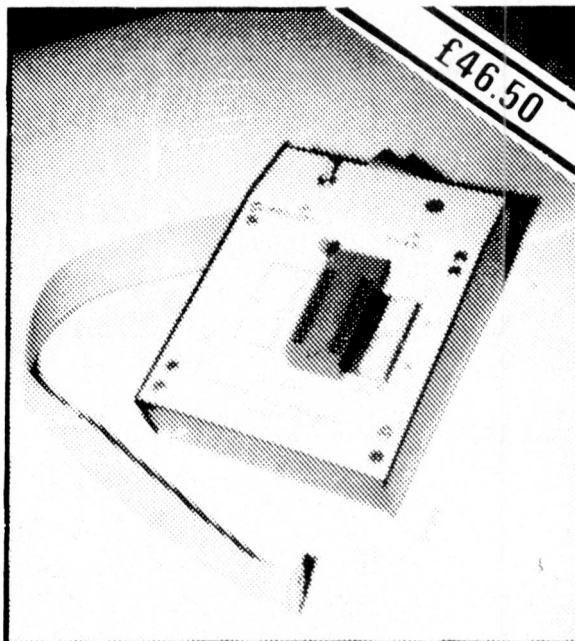
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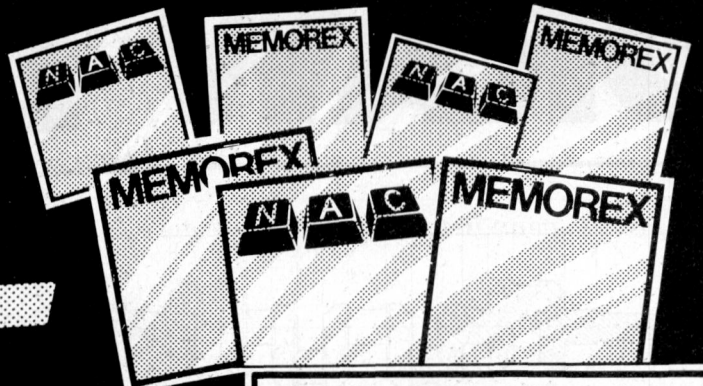
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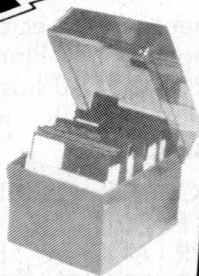
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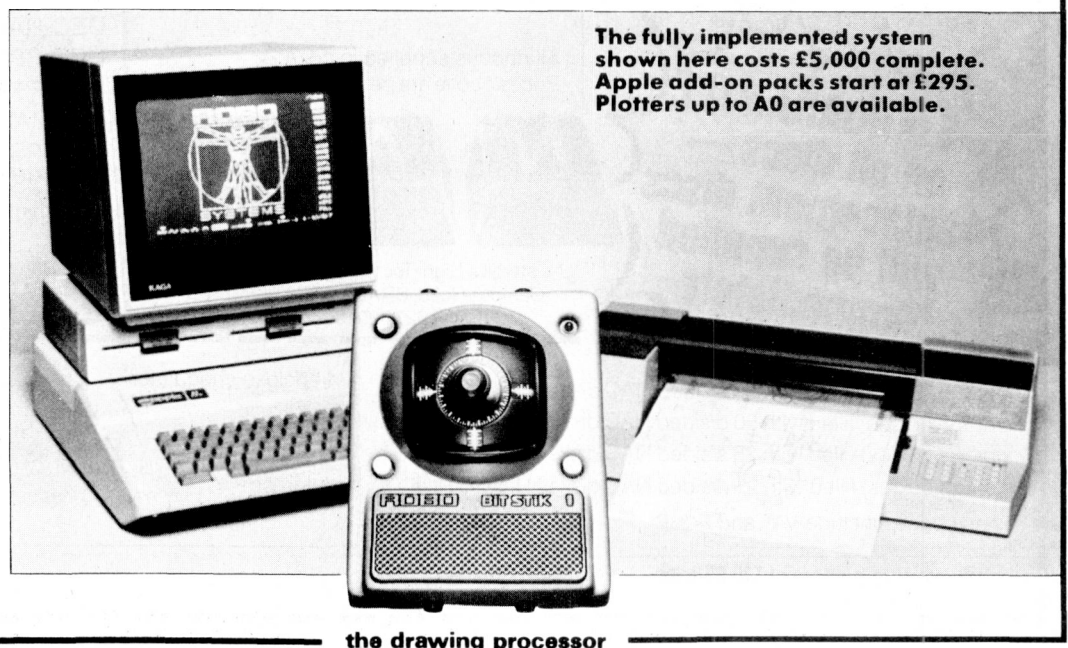
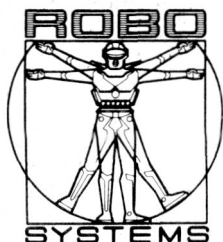
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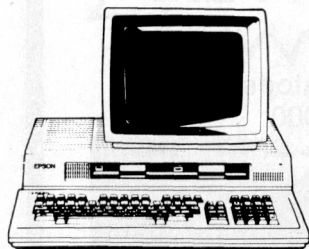
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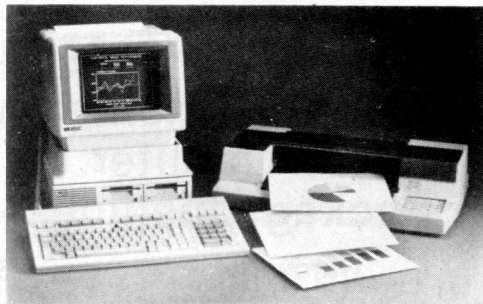
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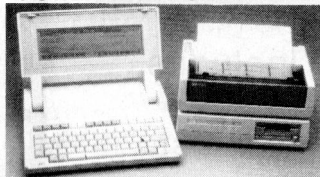
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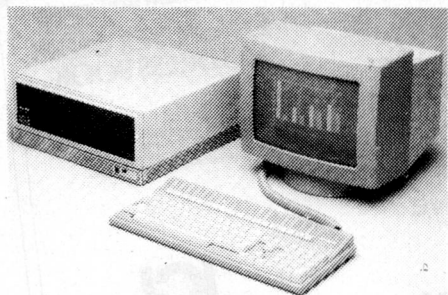


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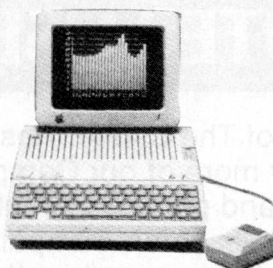
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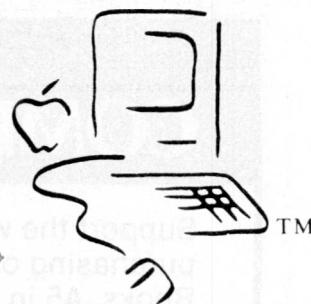
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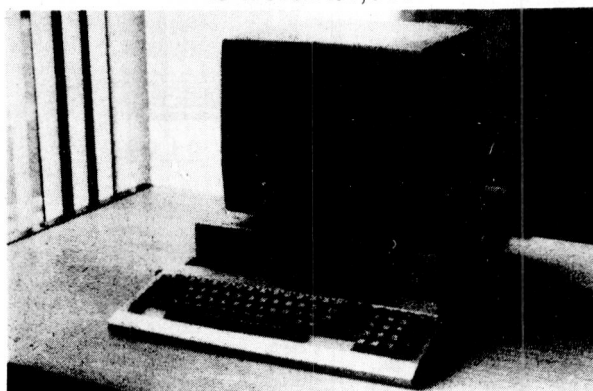
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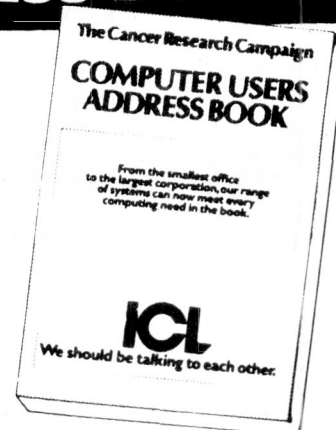
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## Business Systems



# Tasha

## Business Systems

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| Brother EP44         | £220 |
| Juki 6100            | £325 |
| Silver Reed          | £325 |
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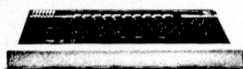
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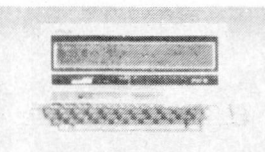
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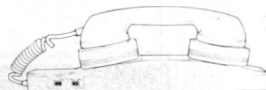
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| CE 158 RS232    | £120 |
| CE 158 Recorder | £32  |

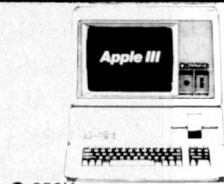
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## PRINTER BUFFER

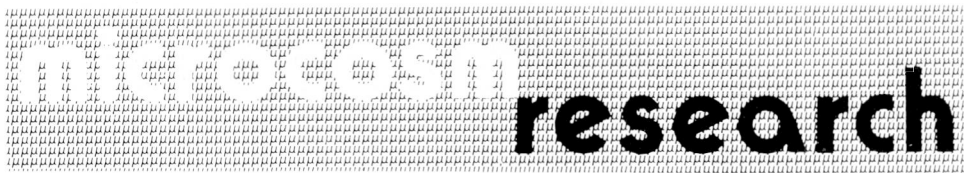
Also included in **MicroCache** is a printer buffer. This enables printing to apparently occur immediately by 'printing to RAM'. Actual output to the printer occurs in background mode without delaying the user. The RAM used by the disk cache is dynamically shared with the printer buffer; whichever is causing you most delay automatically gets the most RAM. This is a much more cost-effective way of saving time than purchasing expensive add-on printer buffer boxes.

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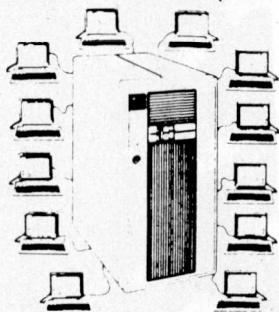
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| ** IBM PC DOS Only         |                           |

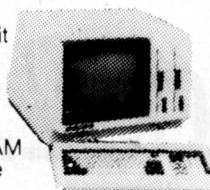
**FORMATS:** Superbrain, Televideo, Sirius, Sanyo  
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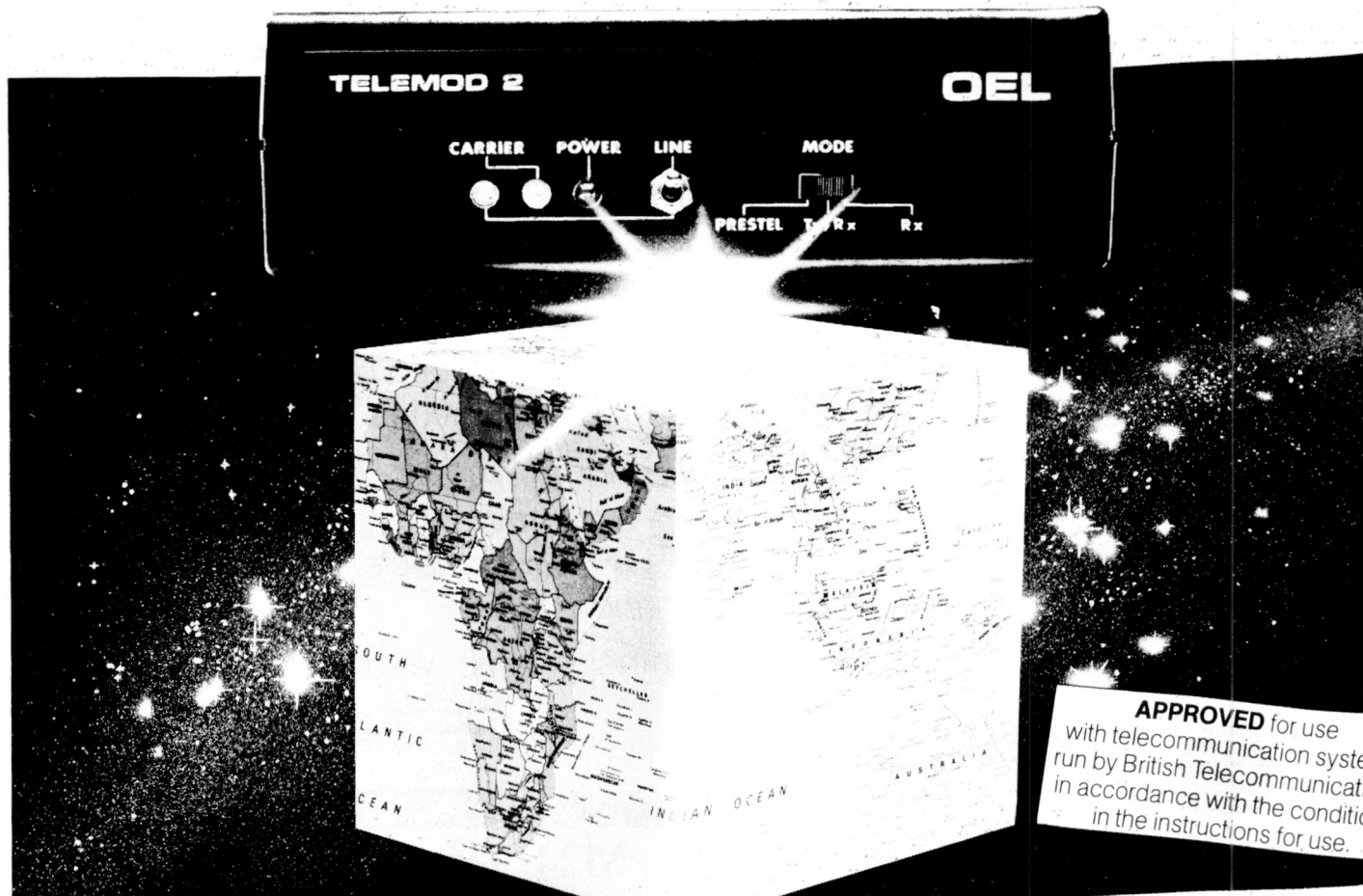
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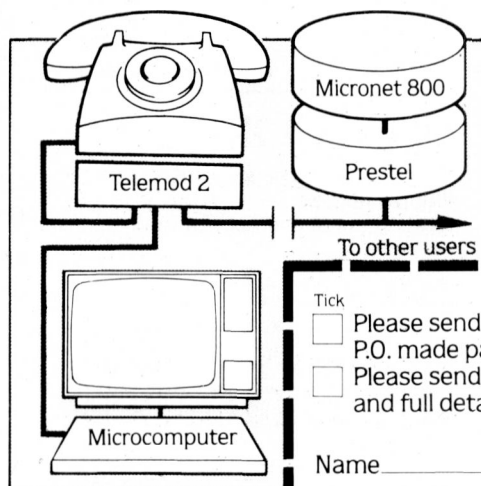
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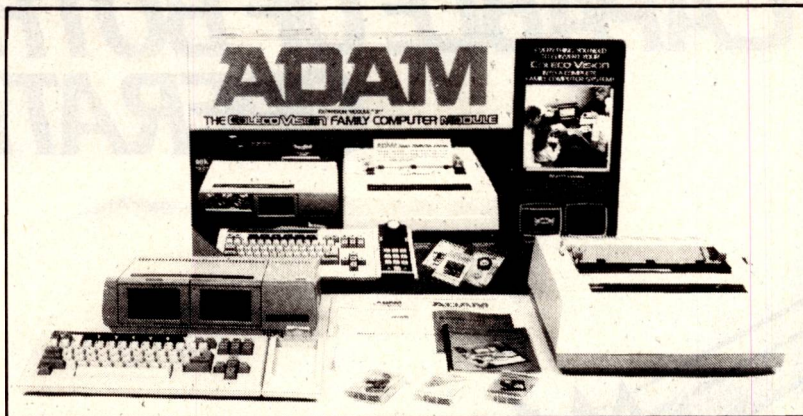
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If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console\* with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.

**MEMORY CONSOLE/DATA DRIVE:** The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accommodate a second optional digital data drive.

**FULL STROKE KEYBOARD:** The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

**LETTER QUALITY PRINTER:** The SmartWriter letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typescripts are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's SmartWriter word processing program or as a stand alone electronic typewriter.

**BUILT-IN WORD PROCESSOR:** Adam comes with SmartWriter word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

**COMPATIBILITY WITH COLECOVISION:** By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

**WHAT IS COLECOVISION:** Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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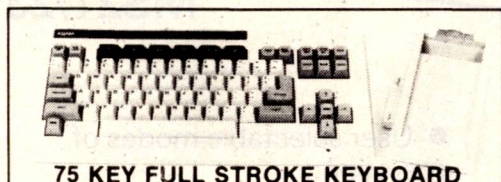
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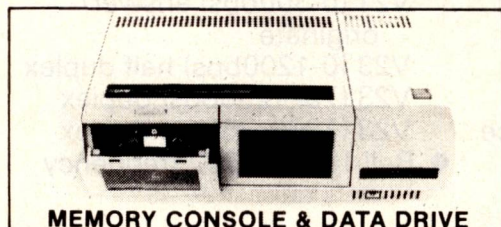
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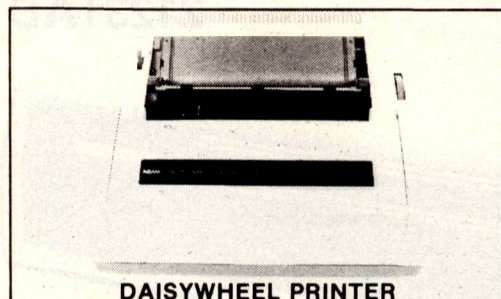
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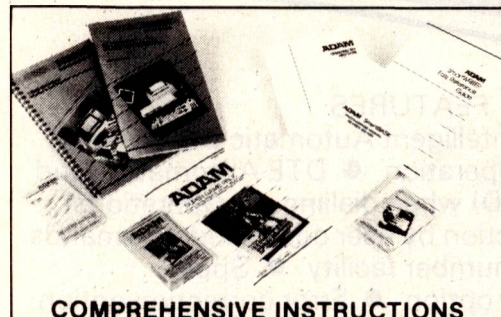
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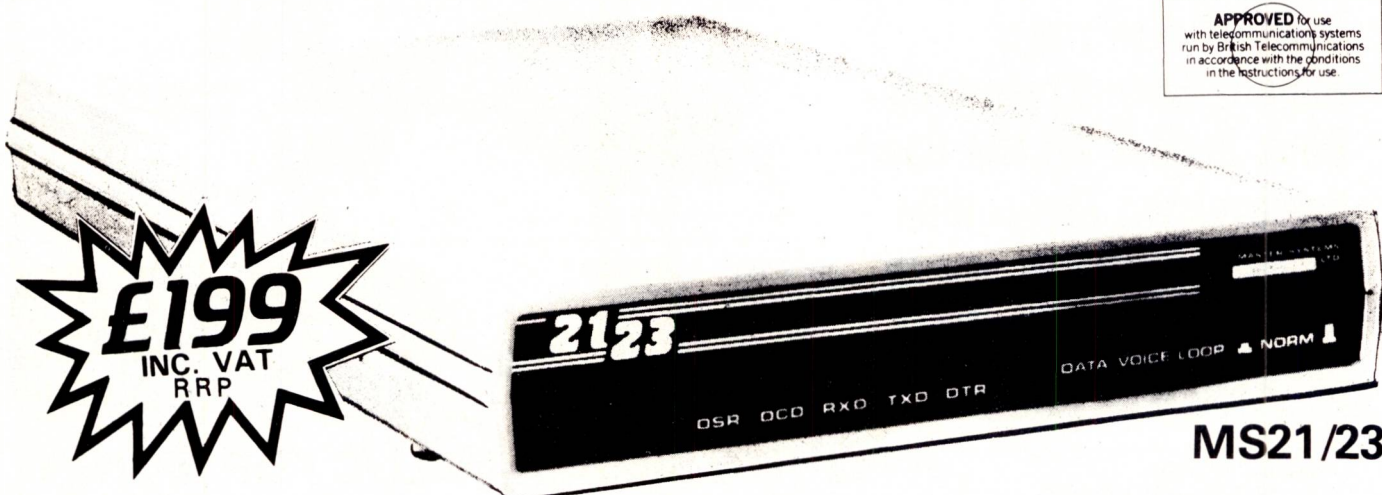


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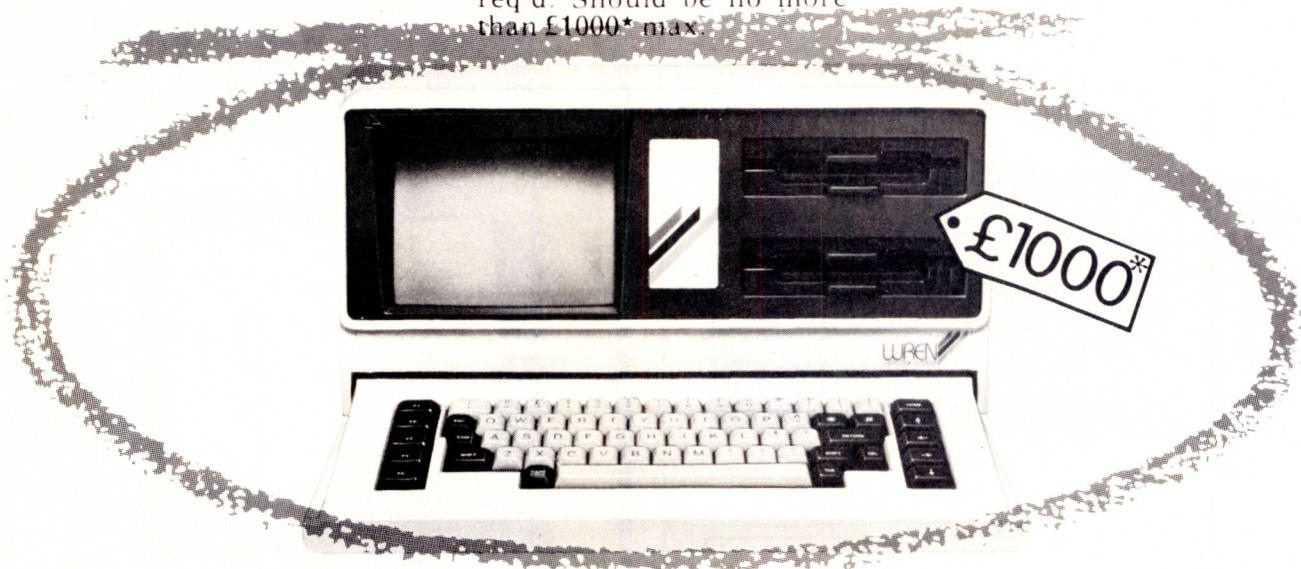
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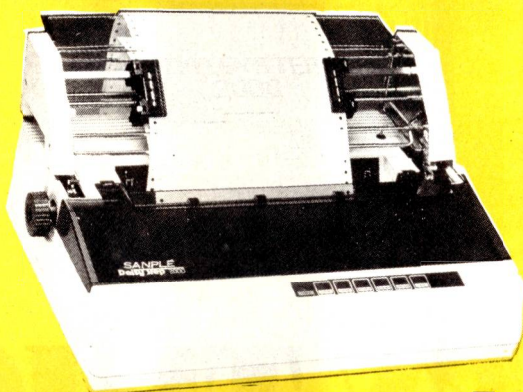
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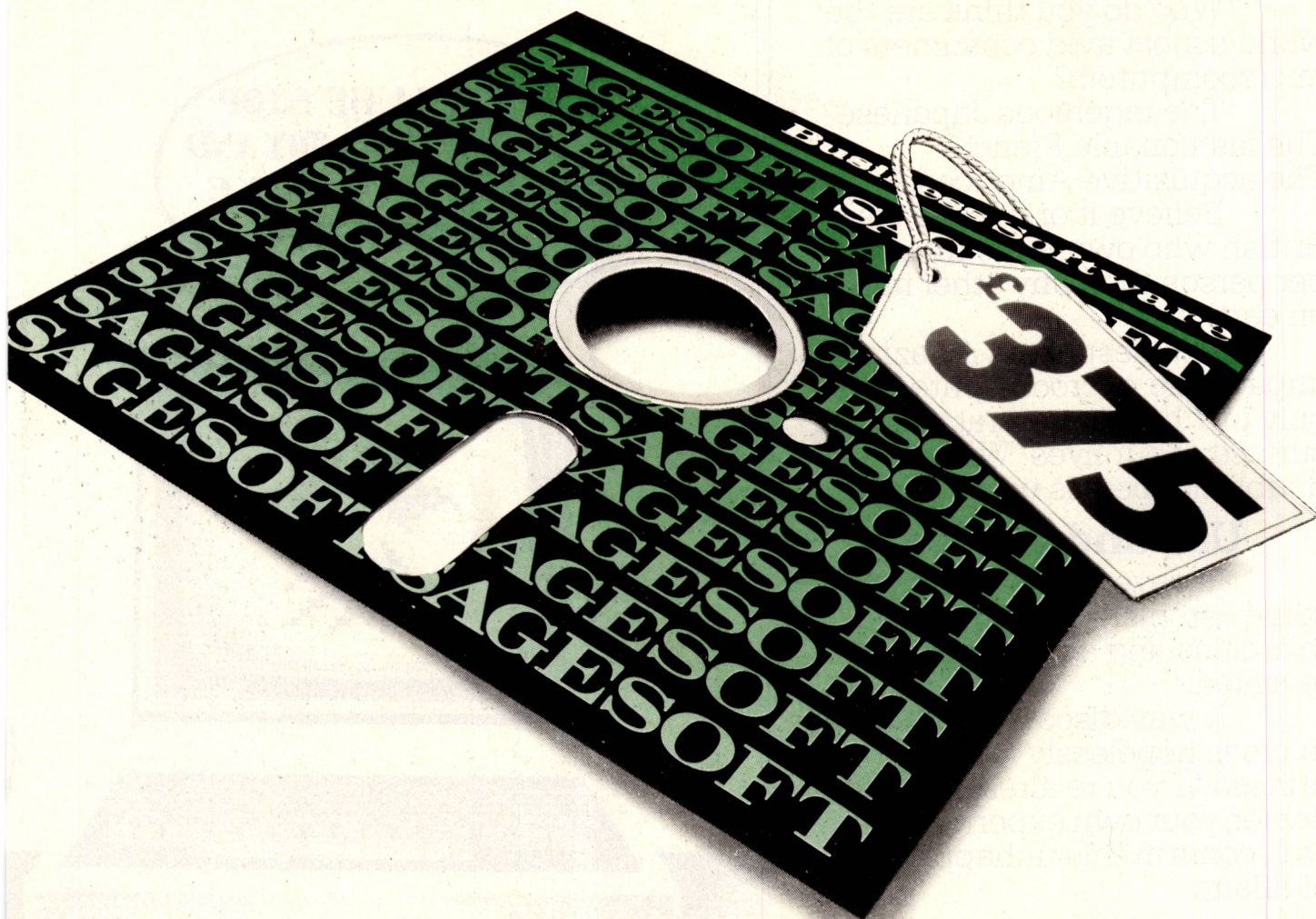
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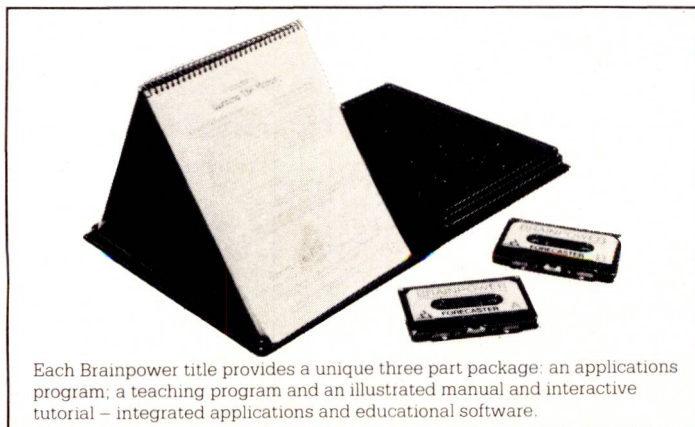
It was discovered that the micro is hopelessly under-utilised. If you're already a micro owner, your own experience may well confirm this unhappy state of affairs.

## Brainpower. A source of knowledge.

For thousands of years, the key to self improvement has been in the hands of the written word. Now, thanks to the Brainpower range, it's very much in the hands of the micro.

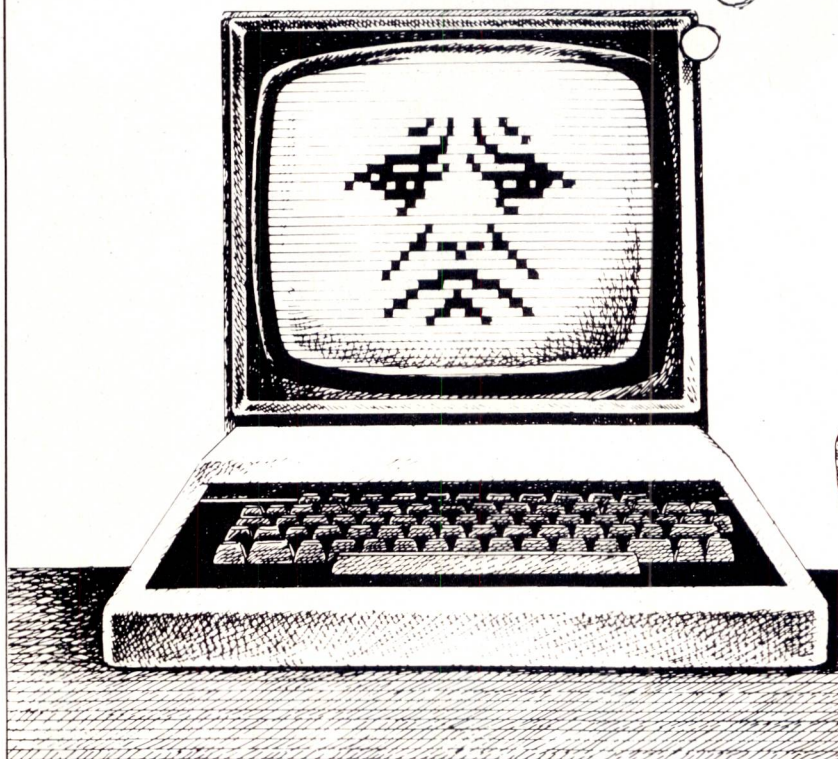
As the Brainpower range demonstrates, this does not require prior knowledge of micros, or how they work.

The Brainpower concept has been devised as *integrated* applications and educational software. And its aim



Each Brainpower title provides a unique three part package: an applications program; a teaching program and an illustrated manual and interactive tutorial - integrated applications and educational software.

WHEN WILL HE STOP  
USING ME LIKE A TOY AND  
START USING ME LIKE  
A COMPUTER ?



# Now you and bring out the b

is to stretch both your mind and your imagination.

It offers a unique way to realise your own full potential and that of your micro. In a way you could never hope to achieve from the printed word alone.

In this respect, the Brainpower range stands on its own.

## A unique concept.

All the Brainpower titles share one thing in common, apart from their stimulating subject matter, that makes them unique.

You will find each title comprises three distinctive elements: A teaching program that helps you to get to grips



IKNOW HE'S GOT A  
BRAIN IN THERE. IF ONLY  
I COULD DISCOVER THE  
BEST WAY OF USING  
IT.

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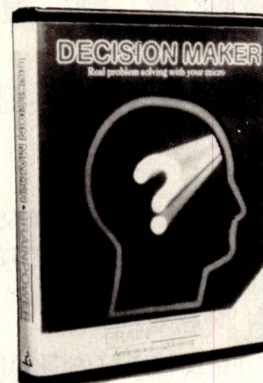
The secrets of the heavens are yours. Isolate all the constellations as well as main stars for easy identification. Even turn stars and constellations on and off at will. Screen by screen, you will see exactly how the 1,500 brightest stars move through time and space. And all from any point on the Earth's surface at any time of the year.

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Should you buy a new house? Change jobs? Have children? Start your own business? Such decisions should not be taken lightly. Armed with Decision Maker, you can be quite sure of examining every avenue, and arriving at a rational, structured answer.

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You have the measure of any situation because you have the fullest possible grasp of all the factors which affect it.

#### FORECASTER

Forecaster takes the guesswork out of forecasting, by accepting that tomorrow's events will be best predicted on the basis of today's facts. Armed with Forecaster, sales targets and growth trends, even sporting events and election results can be accurately and very quickly predicted.

Invaluable to you in both your private and business life.

#### ENTREPRENEUR

Entrepreneur teaches you all the steps required to plan and start your own business. It will forecast your first 18 months' cash flows, generate your Profit and Loss Account and Balance Sheet. Help you in discussions with your bank manager and partners. Explain the notions of assets, liabilities, overheads, working capital, cash flow and break even point.

Invaluable to anyone who is planning a business venture.

# our micro can st in each other.

with the subject at your own pace. An applications program to put what you learn into action. And finally, with each package, you get an expertly written book and interactive tutorial.

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| Numbers at Work  |                 | N/A           | N/A                          |                         |                         |
| Star Watcher     |                 | N/A           | N/A                          | N/A                     | N/A                     |
| Entrepreneur     |                 | N/A           | N/A                          |                         |                         |
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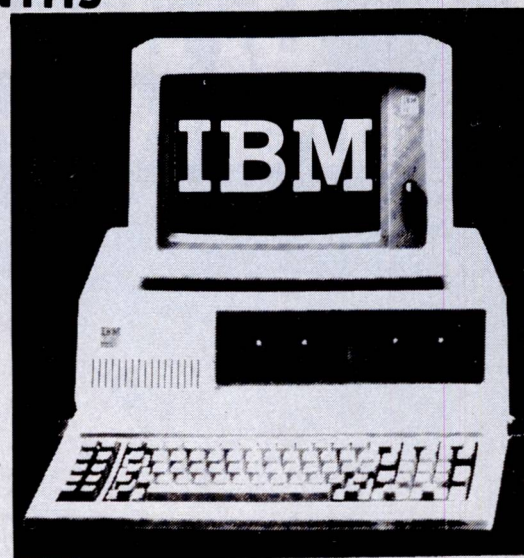
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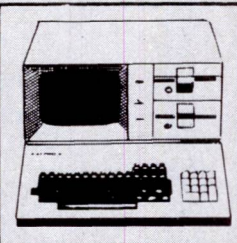
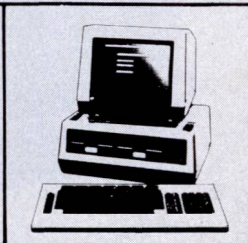
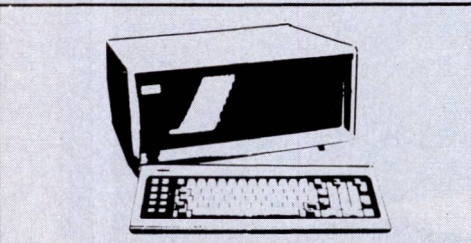
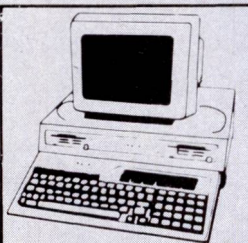
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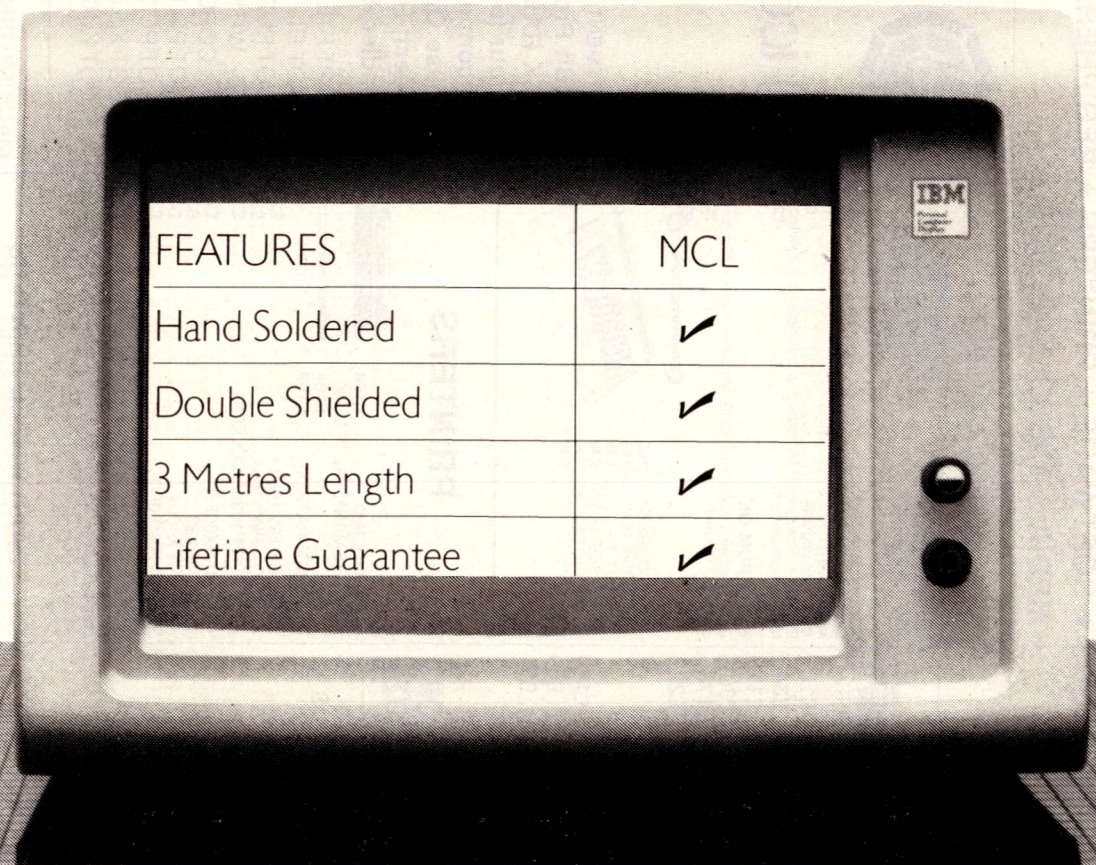


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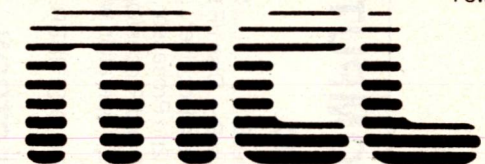
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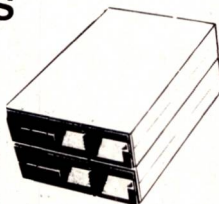
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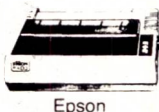
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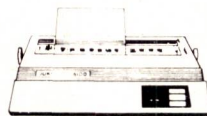
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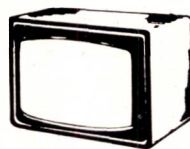
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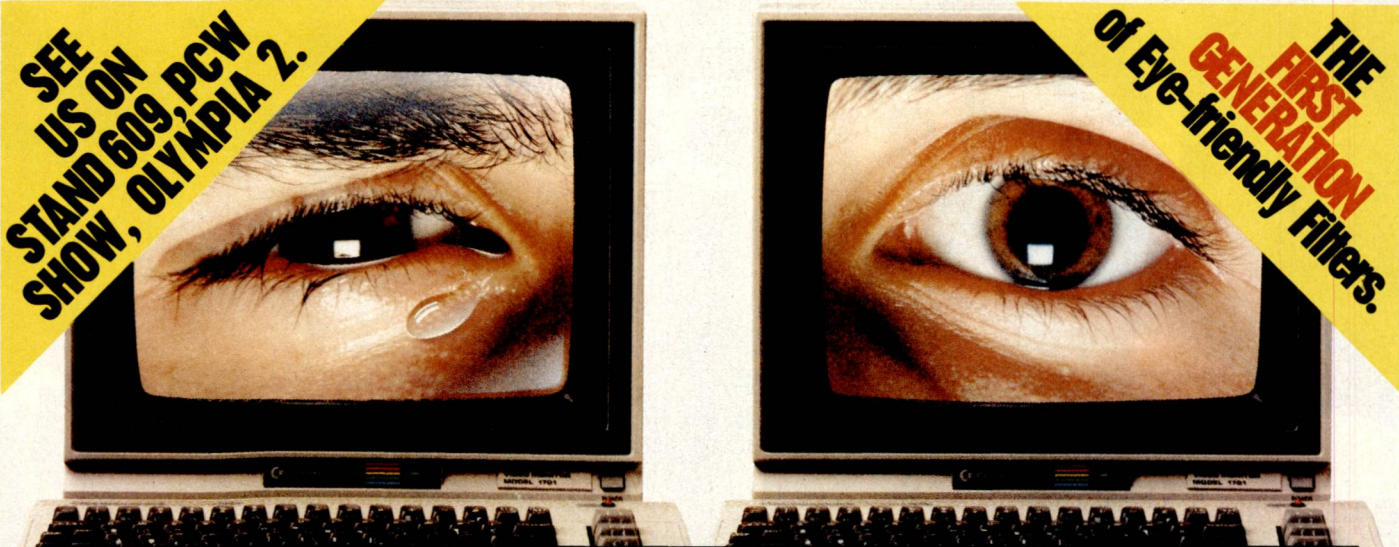
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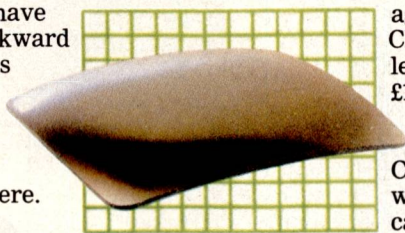
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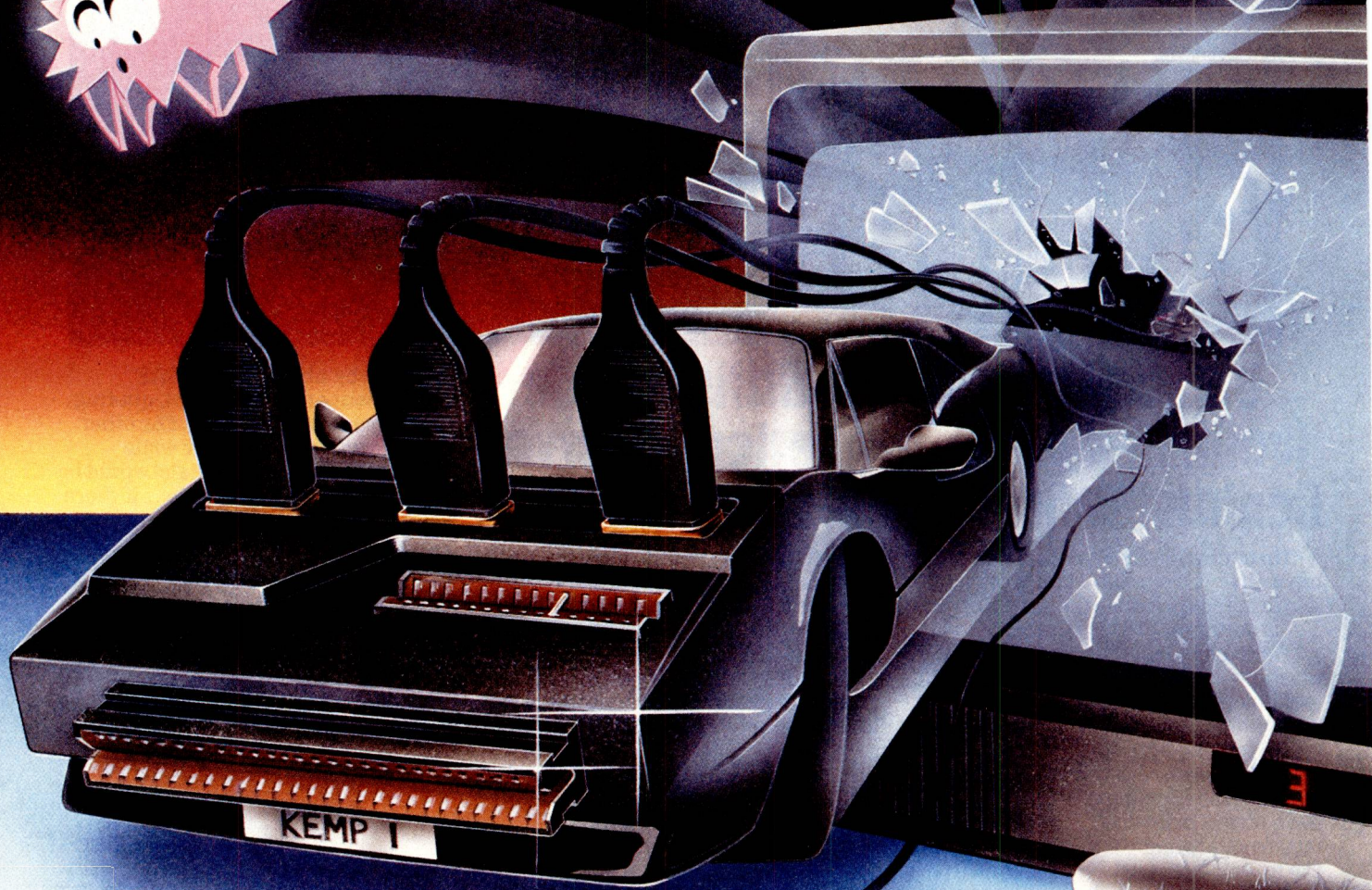
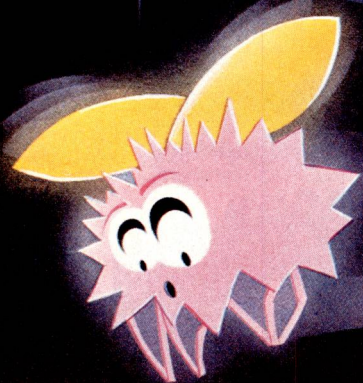
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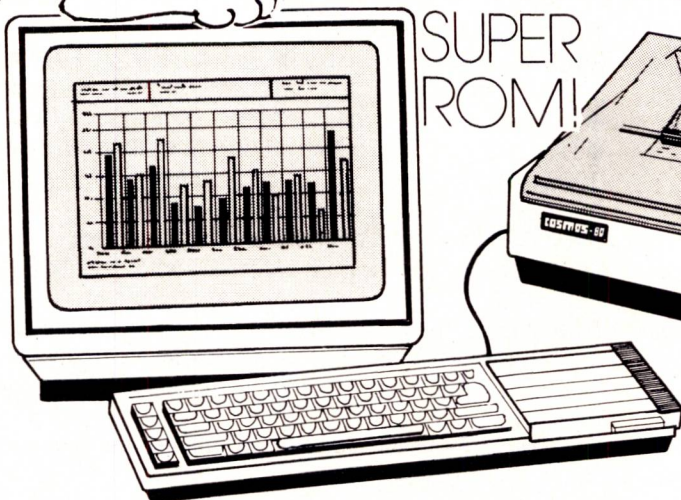


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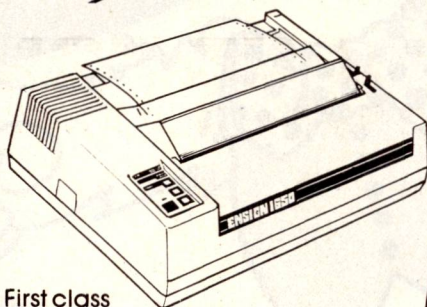


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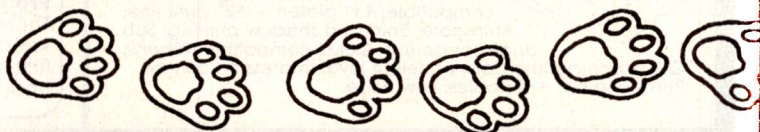
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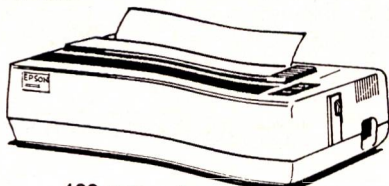
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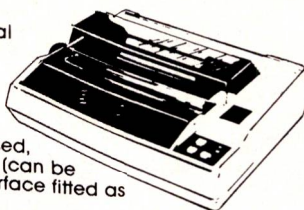
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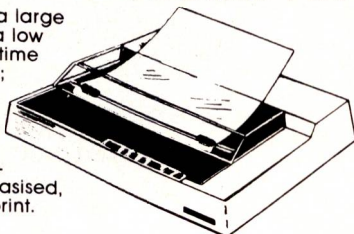
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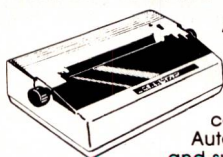


## ADMATE DP80 — ~~£229~~ **£169.00** + VAT

The Admate DP-80 has a large range of features and a low price. Ideal for the first time user. 80 cps; 80 column; Bi-directional logic seeking; block and dot addressable graphics; sub/superscript, auto underline, condensed, emphasised, expanded and italic print.



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### Introducing Macintosh.

Macintosh's brain is the same blindingly-fast 32 bit MC68000 micro-processor that powers the Lisa personal computer.

Its heart is the same Lisa technology of windows, pull-down menus, mouse commands 32-bit power more useful by making Macintosh far easier to use.

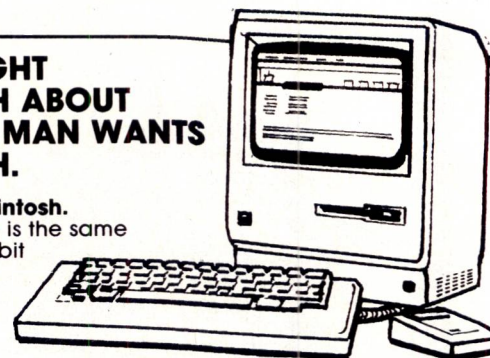
### Now for some small talk

If the problem won't come to Macintosh, you can always take Macintosh to the problem — it weighs 9 pounds less than the most popular portable computer.

Just pick Macintosh up by its built-in handle, and carry it. A miracle of miniaturisation is Macintosh's built-in 3½" drive. Its discs store 400K — more than conventional 5¼" floppies.

### Programs.

There are already plenty of remarkable programs available to keep Macintosh busy. Like MacPaint a program that, for the first time, lets a personal computer produce virtually any image that the hand can create.



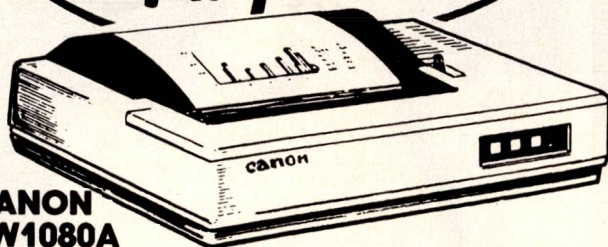


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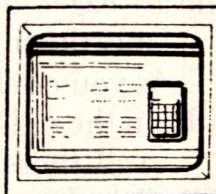
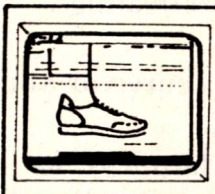
There's more software on the way from developers like  
Microsoft, Lotus and Software Publishing to mention a few. And  
with Macintosh BASIC, Macintosh PASCAL and our own  
Macintosh Toolbox for writing your own mouse driven  
programs, you could turn a few bob in your spare time.

#### All the right connections

On the back of the machine, you'll find built-in RS232 and  
RS422 Applebus serial communication ports for connecting  
printers, modems, and other peripherals without adding  
expensive cards. If you wish to double Macintosh's storage  
with an external disc drive, you don't have to pay for a disc  
controller card — that's built in too.

#### Talking of extras

Macintosh has a built-in polyphonic sound generator capable  
of producing high-quality speech and music.



Macintosh automatically makes room for illustrations in text.  
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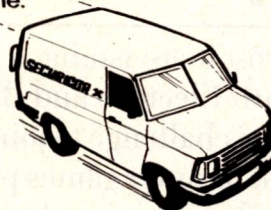
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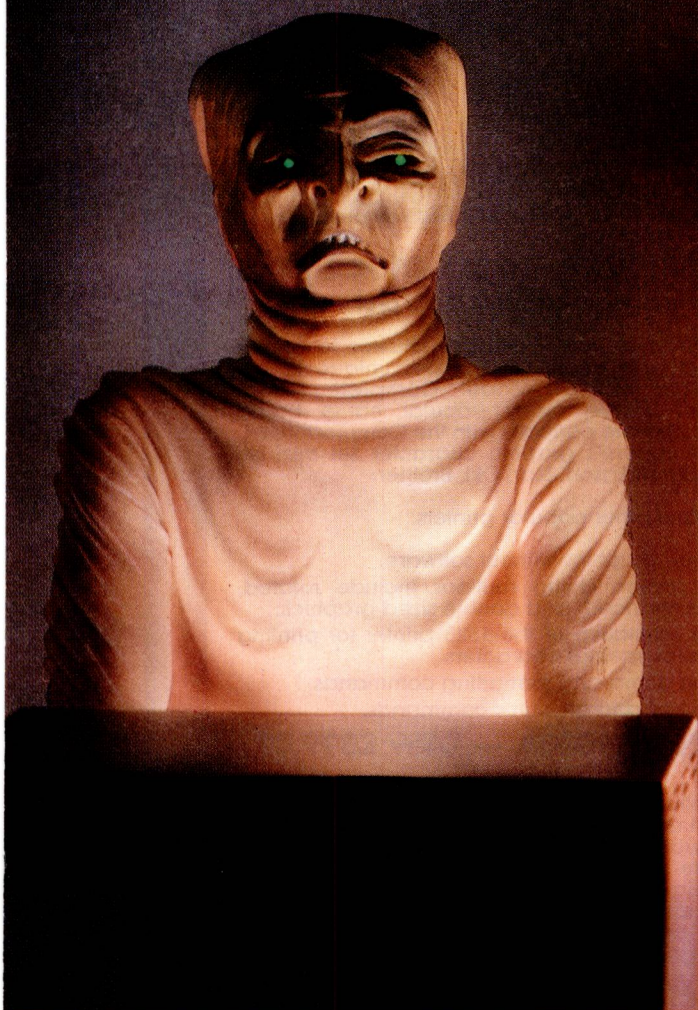
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Acornsoft are issuing a nationwide challenge to all Acorn Electron and BBC Micro users.

It's the challenge to join a new and exclusive group of computer games players: The Elite.

With 3-dimensional graphics, Elite is a game which is light years ahead of any other.

It strictly defines the rank of each and every player.

As your prowess improves, you move into higher ranks.

But make no mistake, to reach the top rank, your performance must become exceptional.

**Then, and only then,** will you qualify to call yourself a member of The Elite.

From harmless, you must become lethal.

In Elite, all players start as equals.

With the initial rank of "Harmless," you will

embark upon an experience unlike any that you have known before.

You will be a space trader who roams the universe, making your living from buying and selling the cargo in your Cobra space craft.

On your travels, you will encounter aggressors who are eager to put an end to your dealings.

Only the fittest will survive.

As you establish yourself as a survivor, you will win the right to a higher rank.

In all, there are nine, from "Harmless" to "Elite." And your computer will continually tell you where you stand.

Trade with 2,000 planets in eight galaxies.

Besides survival, your success also depends on the rewards you reap from the cargo that you carry.





## Are you among the Elite?

That cargo can be anything from foodstuffs to contraband. If you decide to trade in contraband, the rewards will certainly be higher. But so will the risks you take.

To ply your trade, you can dock at any of 2,000 planets in eight galaxies.

However, before you dock, you must use your wits to assess the planet's political climate and the perils which may be waiting for you.

Also, in any of the eight galaxies, you may find yourself being asked to perform acts of considerable heroism and selfless courage.

Although these will bring you into danger, they can bring considerable rewards too.

We're waiting to recognize your skills.

Achieving higher status in Elite will tax your skills to the limit. Which is why you must down-

load your game onto cassette or disc each time you take a break from play.

When you reach the rank of "Competent" or higher, you should send us the secret code number revealed to you by your computer.

We will send you in return a special document which certifies your achievement. And you stand to win a valuable prize.

Are you ready to accept the challenge?

Elite is available on both disc and cassette for the BBC Micro and on cassette for the Acorn Electron.

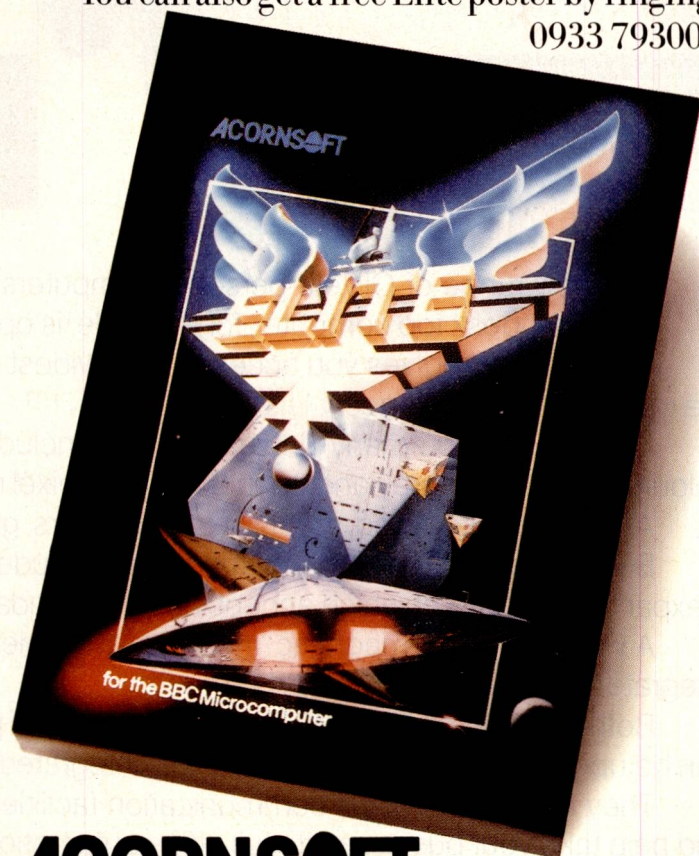


With either, you will get "Elite: The Dark Wheel," a compelling novel which sets the whole mood of your adventure. You'll also get a flight training manual which will get you fit to roar into the unknown in your Cobra spacecraft.

Your Acornsoft dealer now has the entire package at £14.95 on cassette, or £17.65 on disc (for the BBC Micro) and £12.95 for the Electron. (For the address of your local stockist, call 01-200 0200.) Credit card holders can simply telephone 0933 79300 during office hours.

Alternatively, you can order by post from: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

You can also get a free Elite poster by ringing 0933 79300.



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## THE OLIVETTI FAMILY OF PERSONAL COMPUTERS.



The new range of Olivetti personal computers have all been designed to be totally compatible. The M24 desk top computer, for example, is operationally compatible with the industry standard.

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It also offers you many unique features including as standard, a high resolution screen with 16 colours or shades of grey and up to 640 x 400 pixel resolution.

A superbly designed modular format offers greater expandability.

Both serial and parallel interfaces are included in the basic unit, which can also provide up to 7 expansion slots all of which accept industry standard boards.

A wide variety of magnetic media is available from 360 KB or 720 KB slim floppy disks to an integrated or external 10 MB hard disk.

Both the M24 and the M20 are powerful 16 bit personal computers for faster processing and both can be upgraded, step by step, into a fully integrated network system.

They also have in-built communication facilities so they can integrate with other office machines and help take your business into full office automation.



# THEY'RE SO FRIENDLY THEY EVEN GET ON WITH THEIR BIGGEST RIVALS.

But the new Olivetti range doesn't stop at desk top computers. There are also two portables, the M10 and the M21.

The M10 is so compact it fits easily into a briefcase and can be fully operational wherever you are. It can also be linked, via a telephone, to other office machines and bigger computers.

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# 'THE USUAL PROBLEMS OF MAN MEETS WOMAN'

**\* solved by Dateline!**

*Michael Wheeler is an articulate, good-looking businessman in his mid-thirties. Born and bred in London, his work has taken him all over the world. Despite his busy life-style he found time to marry, but unfortunately his marriage failed and he found himself back in London, trying to rebuild his social life.*

'My cousin, who lives in London, suggested that I should join Dateline. I must admit, I found the idea appealing because I was aware of Dateline. In fact, I had been a member way back in the sixties. I found no great romantic successes at that time but many, shall we say, nice encounters, so when my cousin suggested the idea again I thought 'Why not, I'm only going to live once, why not make the best of it?'

Michael didn't join Dateline to find 'the woman of my dreams'. 'I joined because after a long absence from a city like London you tend to find that your friends and acquaintances have married or moved away. Although I obviously missed female company, I also found that I had no circle of friends left at all.'

'When my first list of names from Dateline arrived and I began to receive calls from women with whom I had been matched on the computer, my social life improved out of all recognition almost overnight! My only problem was time, because all of the women I spoke to were so pleasant that I felt I had to meet them. In the event, I met four from my first list of names. Two I felt I could quite happily be friends with; the other two meant rather more.'

Michael doesn't mind people knowing he is a member of Dateline. 'There's not the adverse reaction from family and friends that I think some people may expect,' he said. 'I did perhaps feel, as many people probably do, that there's some sort of stigma about admitting to feeling lonely. But that's rubbish as loneliness affects every person at some stage of their life, no matter what their circumstances. It's something that has to be

overcome by any means available to us. Dateline may sound cold-blooded to some people, but I have found it certainly isn't. It may perhaps be more socially acceptable to meet people of the opposite sex in pubs or clubs, but really Dateline wins above those places. I don't like competing with smoke and noise, and it's far nicer to know that the woman you're telephoning has the interests and desires you're looking for. It provides a basic understanding before you even say hello. Obviously, all the usual problems of man meets woman are still there, but you have conquered quite a few of the barriers that so often make a relationship fail before its really started.'

He stopped to consider for a moment. 'I don't know what you need from life. All I really want is happiness, and a large part of the happiness I seek is the happiness that can be gained from the



relationship between a man and a woman. At least two of the women I have met directly through Dateline have become friends and it's good to know that if I am at a loose end there's someone I can 'phone for a chat or to arrange an evening out.'

*Michael has recently suspended his membership of Dateline. He has met a young woman who is a friend of one of his Dateline introductions. Their relationship has blossomed into love and they are now engaged to be married.*

*If you would like to be one of the many thousands of people nationwide who have been enjoying a new social life, and finding love and happiness through Dateline, complete the simple questionnaire below. We will send you confidentially and completely free, full details about Dateline and how it works, and details of just one of the Dateline members who are compatible with you. Send to:*

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**Do you consider yourself:**

|                                                                                                                                                                                                  |                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Shy<br><input type="checkbox"/> Extrovert<br><input type="checkbox"/> Adventurous<br><input type="checkbox"/> Family type<br><input type="checkbox"/> Clothes-conscious | <input type="checkbox"/> Generous<br><input type="checkbox"/> Outdoor type<br><input type="checkbox"/> Creative<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Intellectual |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**2 Indicate which activities and interests you enjoy by placing a '1' (one) in the appropriate box. If you dislike a particular activity, write a '0' (nought) in the box. If you have no preference, leave the column blank.**

|                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Pop music<br><input type="checkbox"/> Fashion<br><input type="checkbox"/> Pubs<br><input type="checkbox"/> Sport<br><input type="checkbox"/> Pets<br><input type="checkbox"/> Folk music<br><input type="checkbox"/> Jazz<br><input type="checkbox"/> Travelling<br><input type="checkbox"/> Cinema<br><input type="checkbox"/> Good food | <input type="checkbox"/> Politics<br><input type="checkbox"/> Classical music<br><input type="checkbox"/> Art/Literature<br><input type="checkbox"/> 'Live' theatre<br><input type="checkbox"/> Science or technology<br><input type="checkbox"/> Creative writing/painting<br><input type="checkbox"/> Poetry<br><input type="checkbox"/> Philosophy/Psychology/Sociology<br><input type="checkbox"/> History/Archaeology<br><input type="checkbox"/> Conversation |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**3** I am over seventeen and would like you to send me completely free and without obligation, a description of my ideal partner. Plus a free full colour brochure and lots more information about Dateline. I enclose two first class stamps.

**Your sex**    put M or F    **Your Height**    ft.    ins

**Your Age**    yrs.    **Age you would like to meet**    Min.    Max.

**Christian Name** \_\_\_\_\_

**Surname** \_\_\_\_\_

**Address** \_\_\_\_\_

\_\_\_\_\_

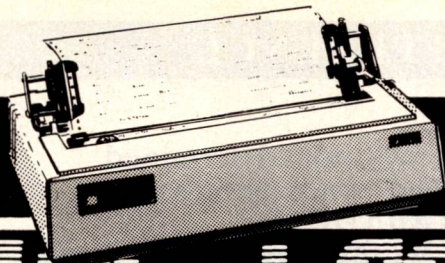
**Nationality** \_\_\_\_\_ **Religion** \_\_\_\_\_

**Occupation** \_\_\_\_\_

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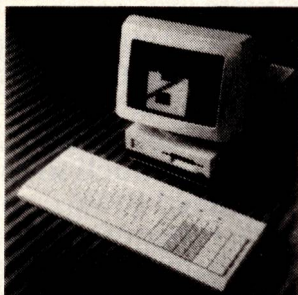
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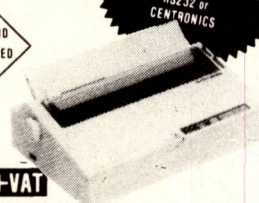
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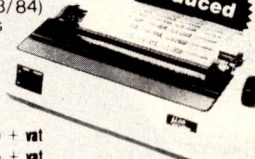


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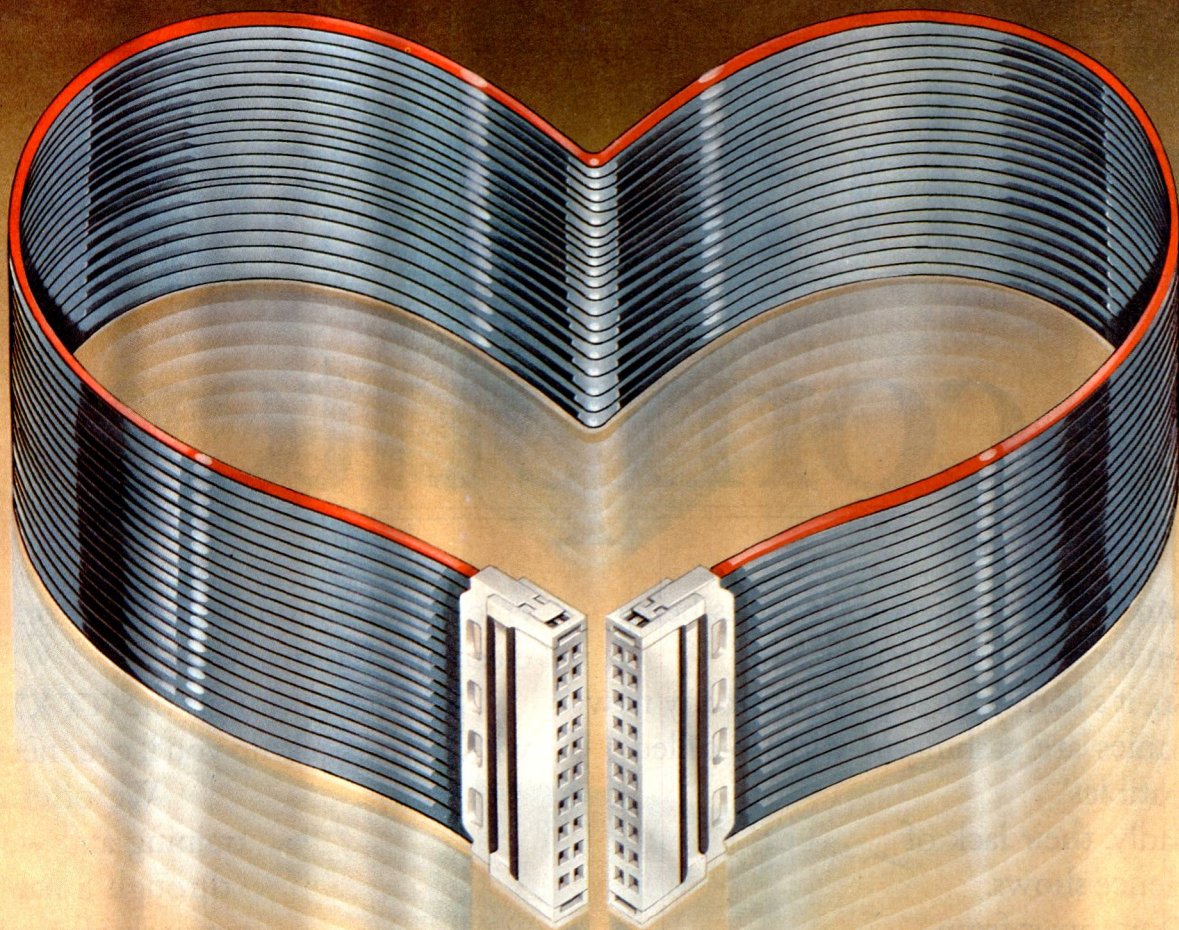


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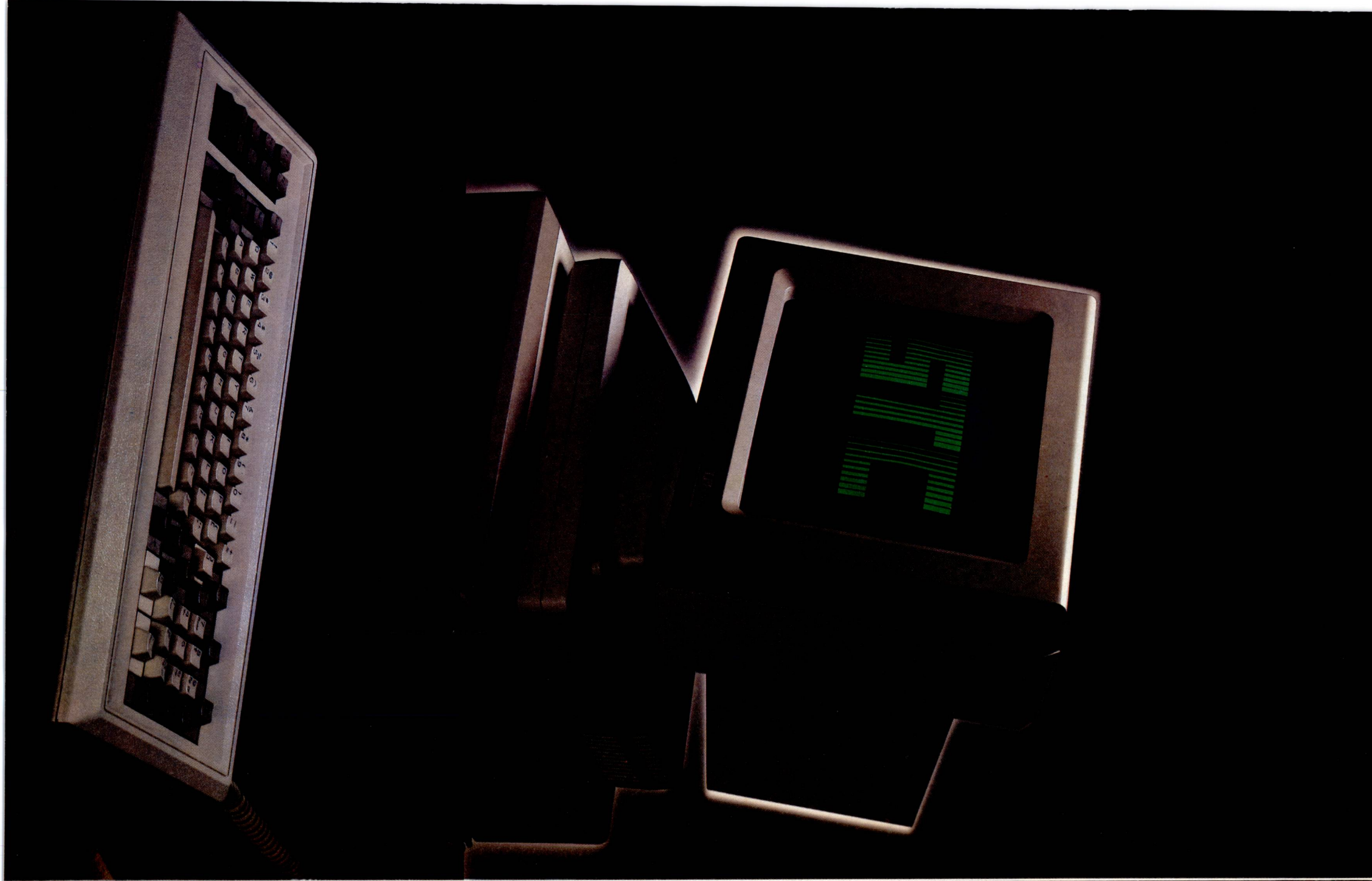


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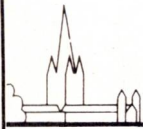
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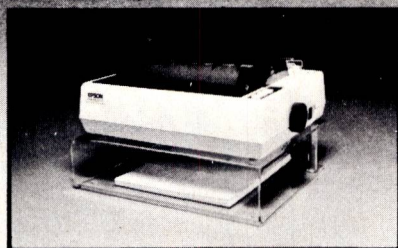
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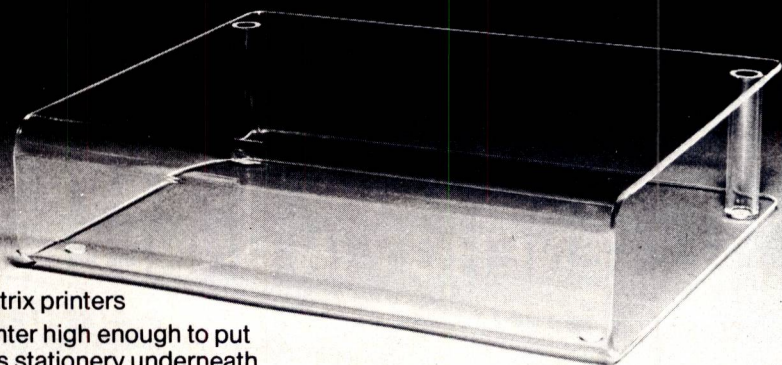


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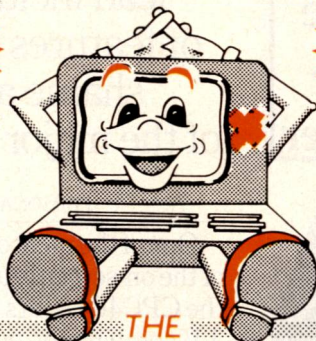
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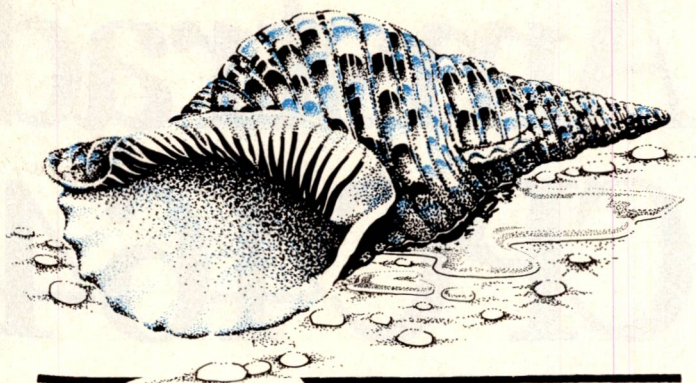
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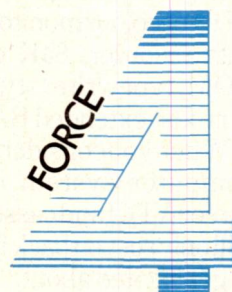
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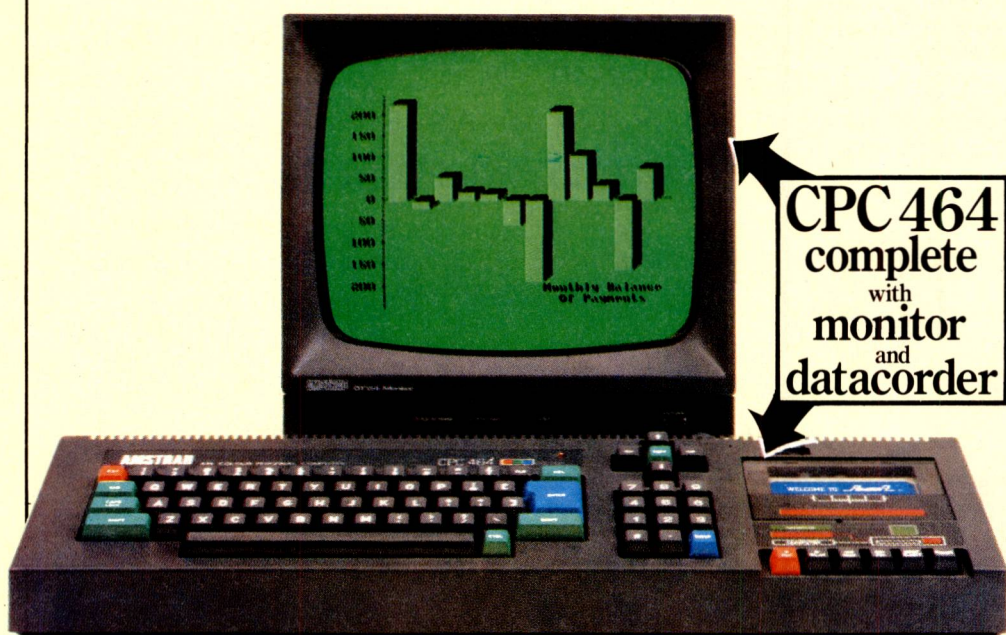
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CPC464 green screen VDU (GT64)

You may have noticed that the press has got very excited about our new computer system.

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Because the new CPC464 comes complete with its own green screen VDU or colour monitor, built-in cassette data recorder, 64K of RAM, 32K of ROM, typewriter style keyboard and a very fast extended BASIC.

When you consider that the complete computer system including green screen VDU and cassetted data recorder will only set you back £239, that's plenty to get excited about.

You can use the green screen version of the CPC464 with a colour TV by con-

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**"I think the Amstrad  
will give a lot  
of sleepless nights to  
Sinclair, Acorn  
and Commodore..."**

POPULAR COMPUTING WEEKLY

Other micros can't get anywhere near the CPC464's memory for the price. Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

Sophisticated and complex programs are easily accommodated.

And the CPC464 offers you high resolution graphics, 80 column text display, up to 8 text windows, a graphics window and a palette of 27 colours.

**"The CPC464...  
in two boxes and one  
lead includes a list  
of features that would  
shame a hybrid  
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PERSONAL COMPUTER WORLD

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**"The Amstrad is  
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Computer complete with green screen VDU (GT64)

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**CPC 464**  
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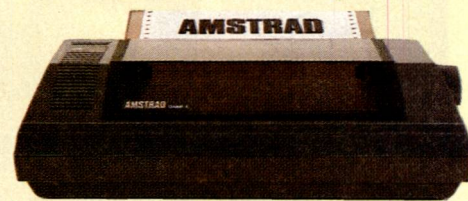
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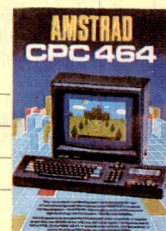
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## CPC 464

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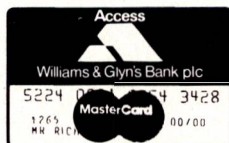
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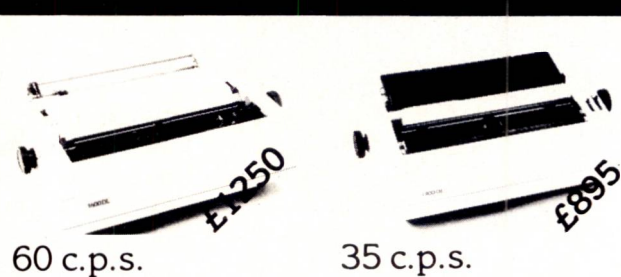


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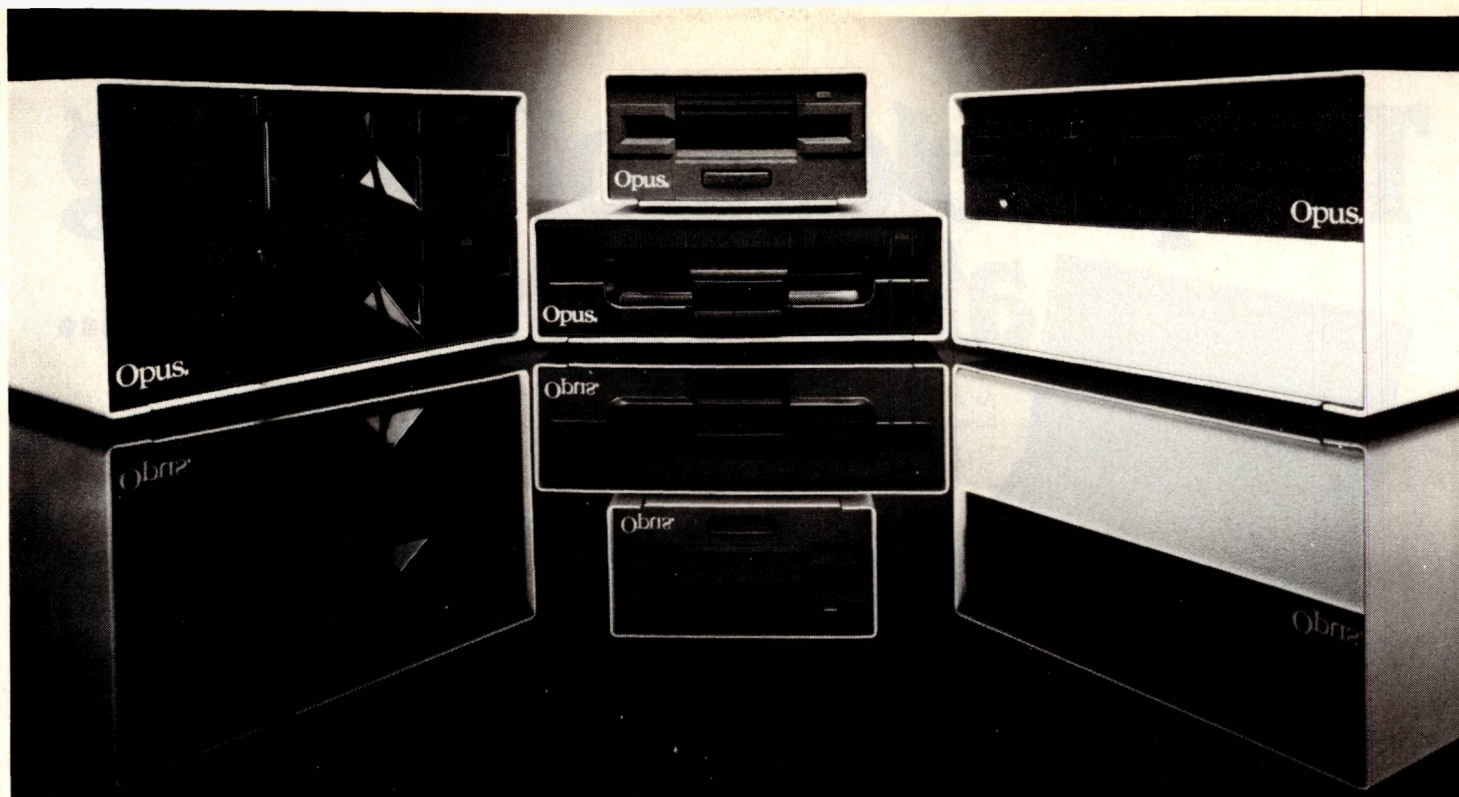
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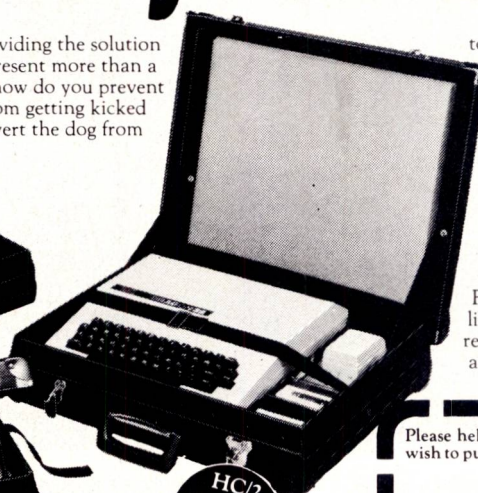
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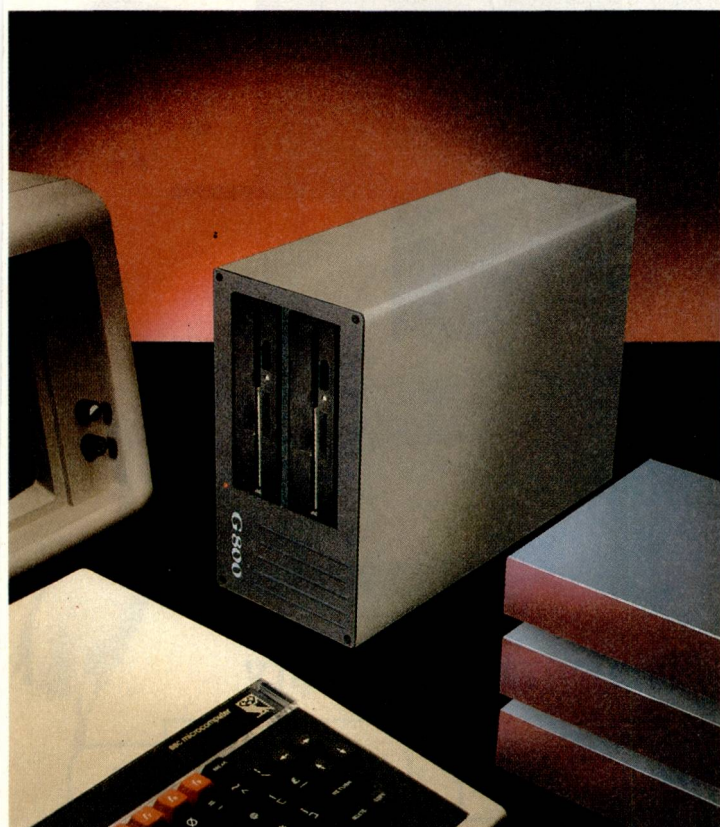
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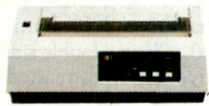
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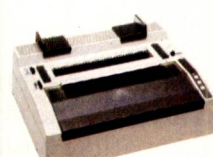
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8510S



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CI-300



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A-10

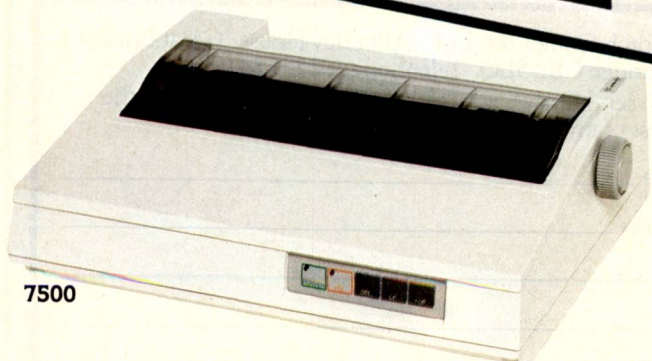


F-10



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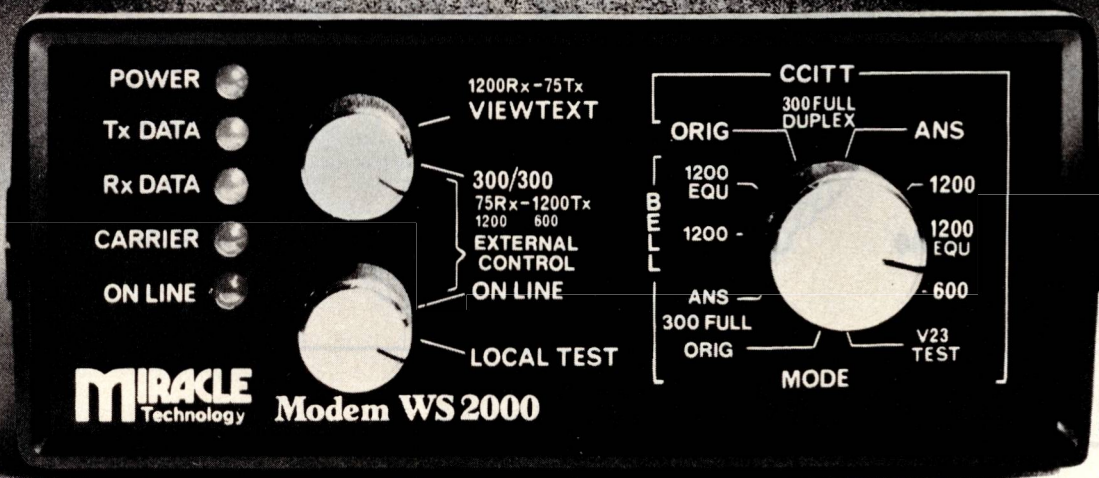
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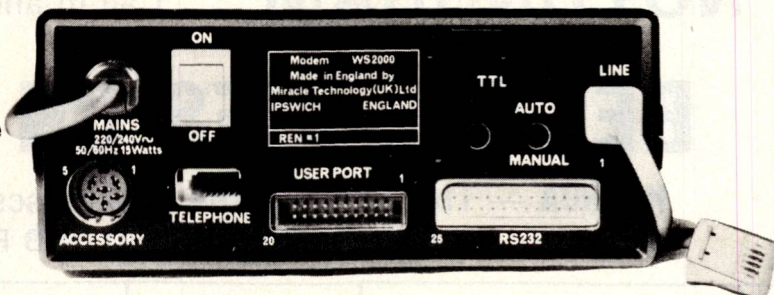
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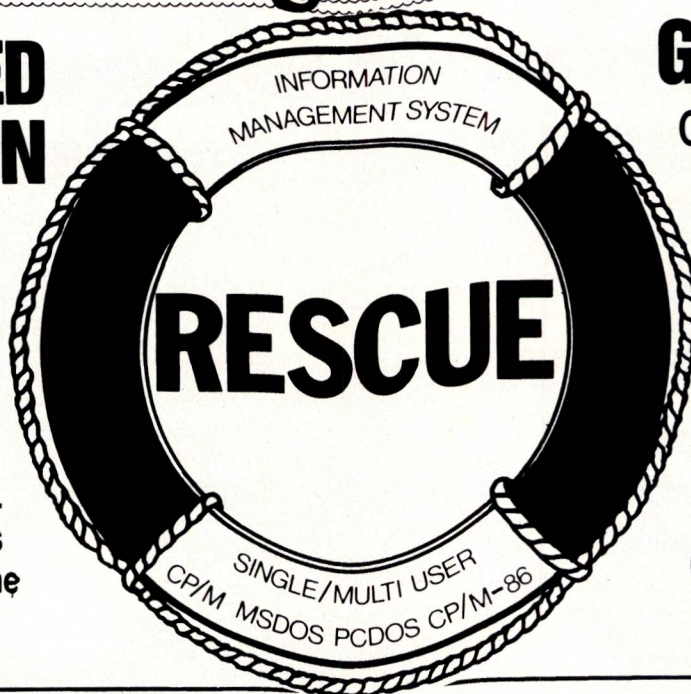
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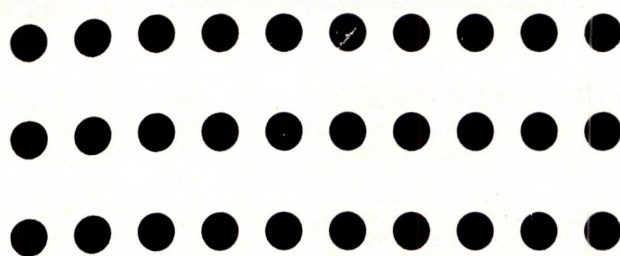


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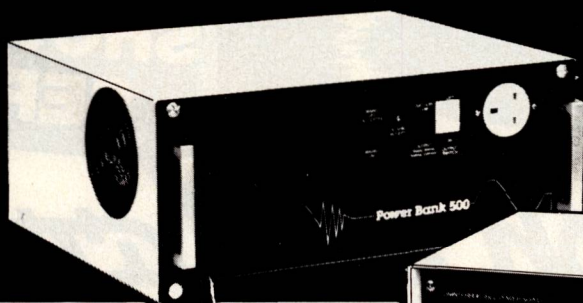
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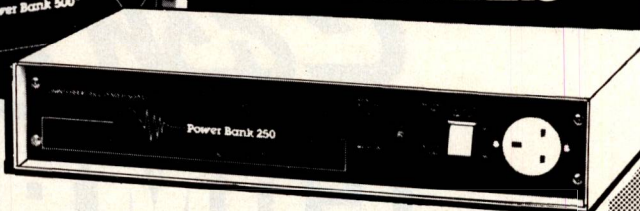
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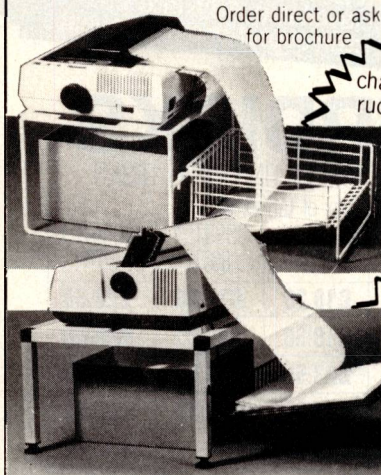
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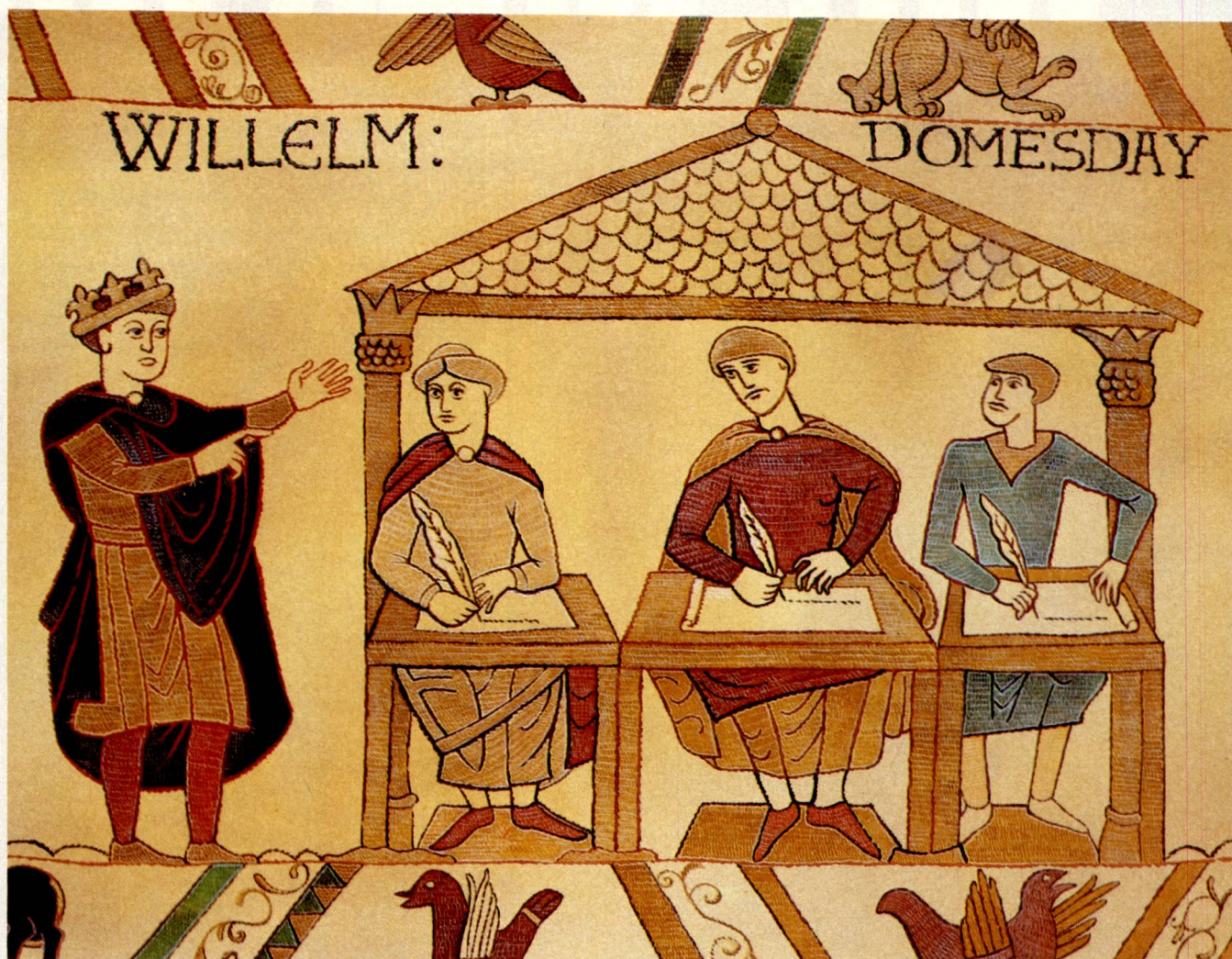
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PCW 10



# Just think what they could have done with dBASE III<sup>TM</sup>



William the Conqueror did what any conscientious manager would do when taking over a new position of responsibility.

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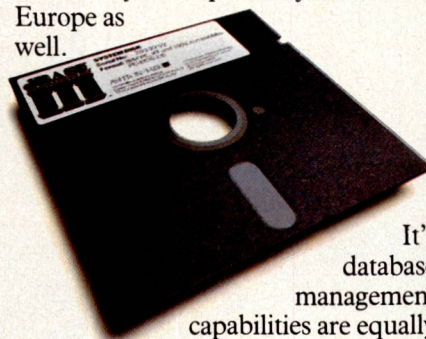
So much so, that by the time the weary clerks had finished, the stock take of the first province on the list was slightly out of date.

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contained in another. You can even include up to 32 procedures in a single file, including parameter passing and automatic variables.

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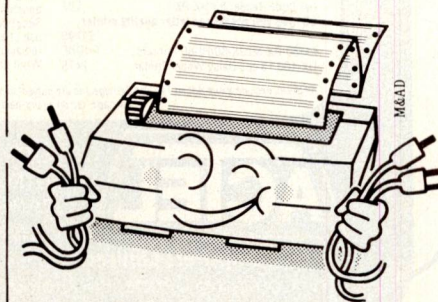


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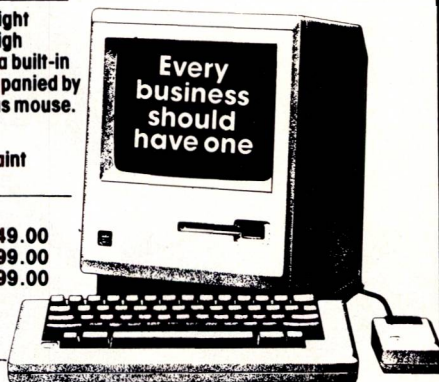
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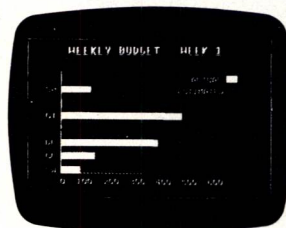
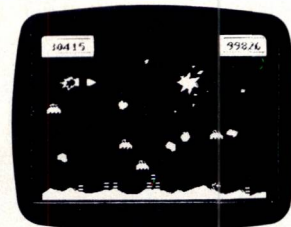


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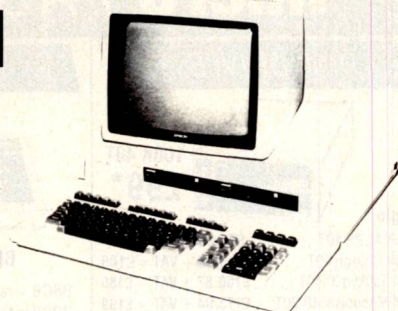
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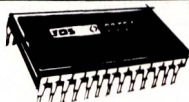
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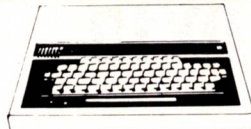
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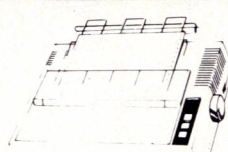


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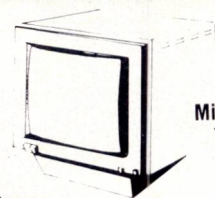
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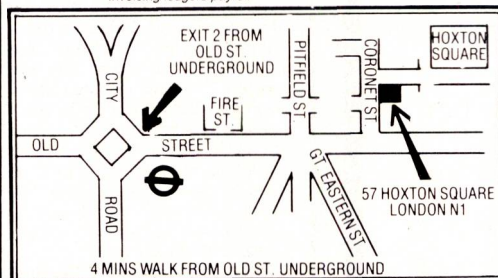
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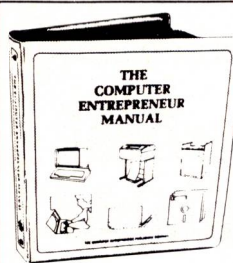
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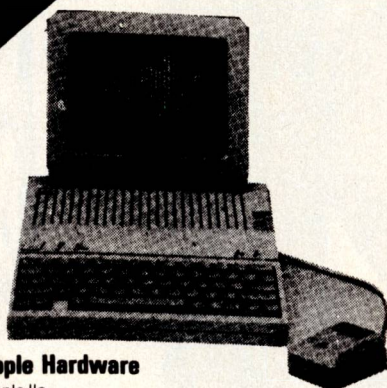
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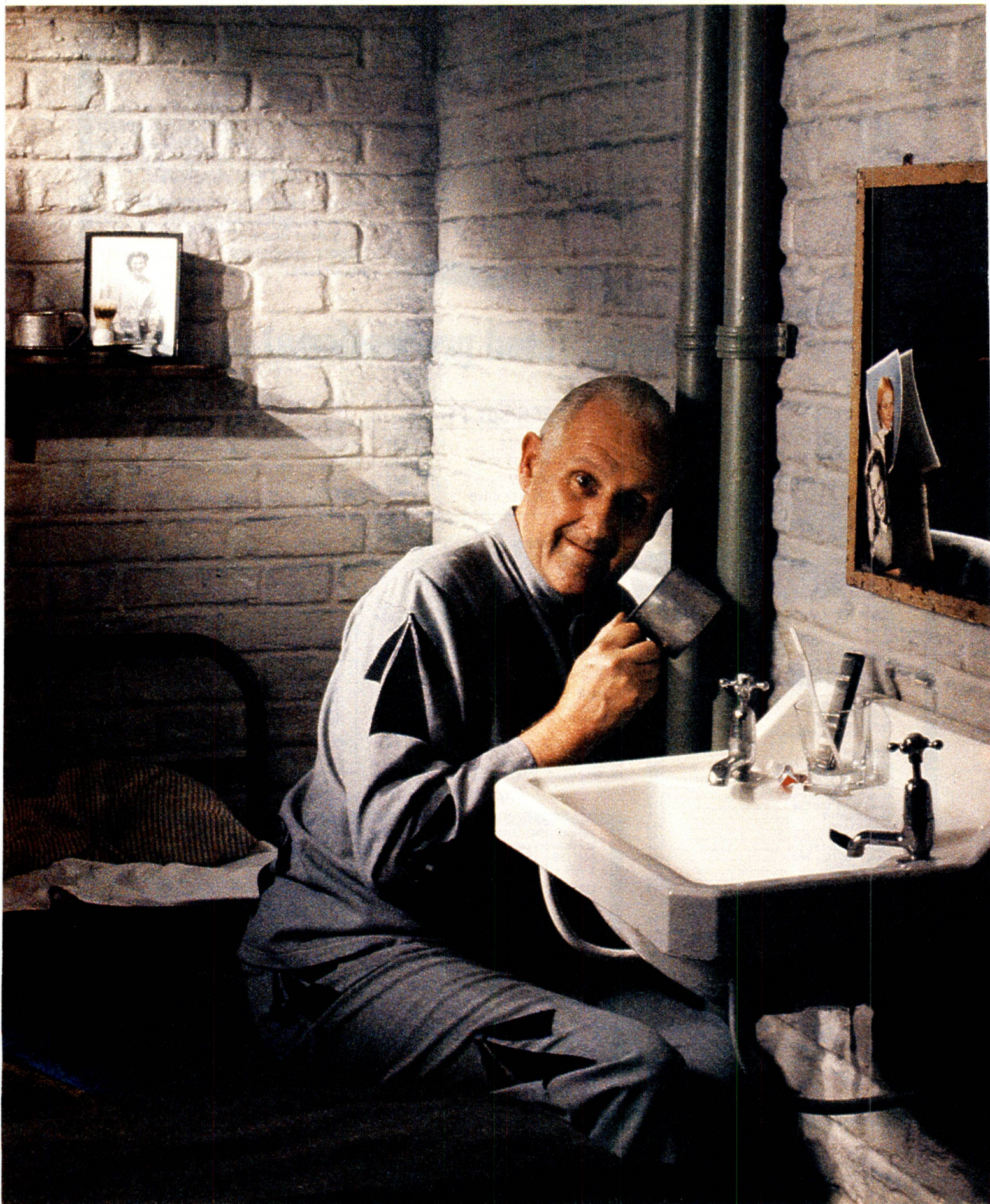


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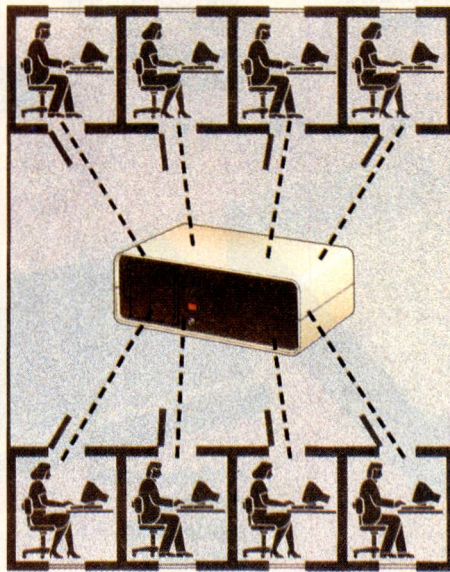
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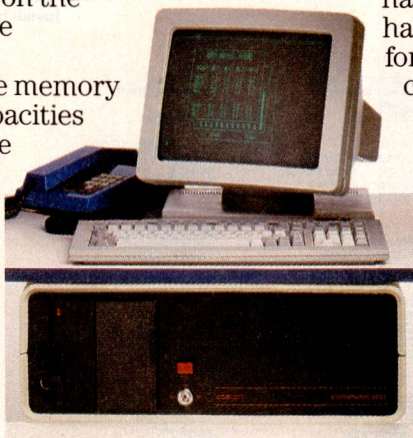
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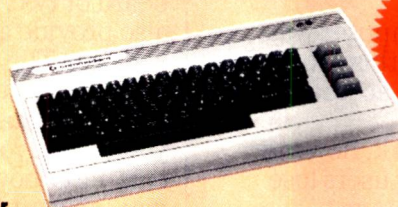


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*The IBM PC celebrated its third birthday recently with a big party—Kewney hopes no-one watched that nasty video, The Evil Dead. Atari got up to its usual fun and games playing musical chairs while the gamblers took to playing the Ace. Just some of the spectacular events Kewney has witnessed during the last month.*

## On with the show

The PCWSHOW is traditionally the place where new machines aimed at the Christmas market are revealed—Enterprise is upholding tradition this year, as—to a lesser extent—is Acorn.

Acorn is previewing its new range of business machines at the Show. The company stresses that this is just a preview, and that the machines will not be launched until later in the year. When they are you'll have to go to dealers to buy them because Acorn has decided that they're too complex for mass market chains to handle.

The BBC B is already being used in business, 'almost accidentally' to use Acorn's phrase. Now Acorn aims to approach this market 'open-armed'—armed in this case with a range of seven machines with various processor options.

Despite reports published elsewhere, the micros will not

be going out as the Professional Workstation Range—ABC (for Acorn Business Computers) is the likely brand name.

The title of Enterprise's new machine is—surprise, surprise—the Enterprise, with previous possibilities Elan and Flan having fallen by the wayside in the long wait for the micro.

Announced at the end of 1983, next news on the machine came earlier this year—to the effect that production was being rescheduled to September 1984.

The company argues that at least the machine will work properly from day one of its launch, and that the delay has given it a chance to develop a supporting range of peripherals and software.

Priced at about £250 for the 64k version, the Enterprise's features include built-in word processing, joystick and networking facilities. October is the time to look for it in the shops.

## Storm in a teacup

Sadly, there was more fuss made about the financial mess that Future Technology Systems (FTS) got into last month, than ever anybody made about the company and its computers.

The mess was indignantly refuted by the outgoing managing director, Peter McHugh, who pointed to a rights issue worth £427,000 which was paid by all but two of the company's 16 institutional investors.

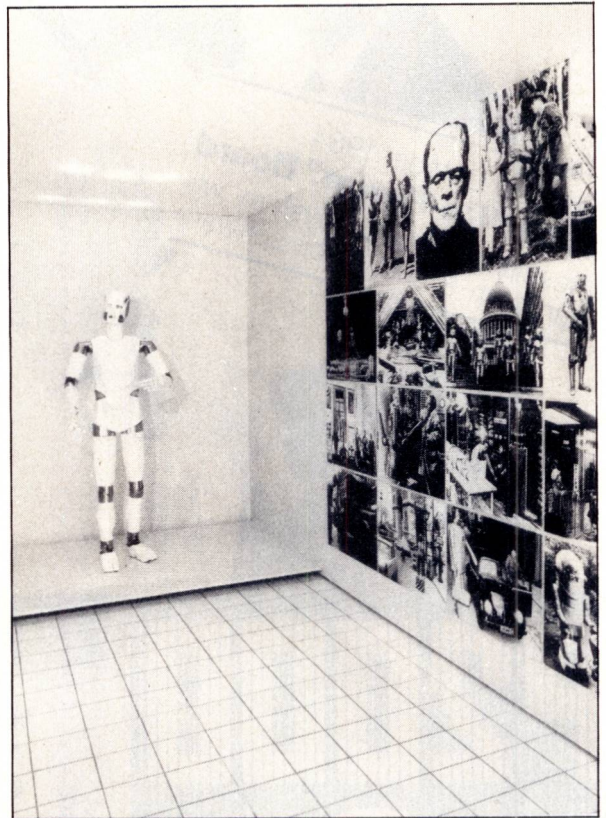
Then the new managing director, the famous champion of engineers, Sir Monty Finnieston, warned journalists that they would be sued if they suggested that McHugh's departure was in any way related to a report from accountants Coopers and Lybrand, which mentioned 'appalling financial mis-management'.

McHugh himself told me that, so far from having left under a cloud, he had actually stayed on longer than he had planned, in order to see the company through its difficult patch.

Sir Monty was then quoted in *Computer Talk* as saying that McHugh was 'an excellent fellow, but I don't think he is an executive managing director.'

And McHugh suggested that the Coopers' report was really 'only one part of a much larger report, and there was no suggestion of malpractice, just the sort of problem any company growing at 800% could be expected to have.'

Everybody at the company observed in hurt tones that orders were flooding in, from Honeywell and from Computer Market in particular. They forebore mentioning Honeywell's dismal track record in micros, and somehow failed to remind journalists that Computer Market is the company which McHugh is running...



*There is still time to see a Silver Reed robot disguised as Frankenstein's monster.*

*The new industrial robot is working on show behind the Victoria and Albert Museum, London, next to a robot built by IBM. Appropriately enough, as Silver Reed makes typewriters, its task is to use a typewriter.*

*The exhibition in the Boiler House seeks to show how the idea of man-like machines is frightening to most people, and to illustrate how these fears have been expressed in the past.*

*'For example, we draw the attention of visitors to the fact that Mary Shelley created her Frankenstein's monster at the time when the Luddites were destroying their new industrial machinery,' one of the organisers told me.*

*More directly interesting to computer enthusiasts, however, is the fact that these robots aren't just moving their arms around.*

*Instead, there are computer terminals, showing the 'thoughts' of the monsters, in terms of the instructions they obey, as they move.*

*The Silver Reed machine has a minimal memory, by computer standards—it can have 800 Basic-like instructions, and no more. These include operations like MOVE and WAIT and ROTATE.*

*The IBM machine is indulging in a more inward-looking vice. It is shown playing solitaire.*

*The Boiler House is behind the V & A, and the show runs until the end of October, so it is still worth planning an excursion, if you're interested. But don't plan on buying the robots, which start at £18,000.*



# A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.

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Einstein was created by Tatung, one of the world's leading electronic companies, and given the capacity and the remarkable capabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer and to businessmen who don't want to lose staff to expensive and time-consuming training courses. At the same time its operating system is both powerful and sophisticated to satisfy the most advanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability to store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow as the business develops.

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†CP/M is a trade mark of Digital Research Inc.



Ah, what fun! And what was all the fuss about, then? It is a perfectly ordinary mini-computer based on the Intel 8086 chip, running IBM software (version 1.0 only) under Concurrent Dos, and offering multi-user (lots of terminals all plugged into the same machine).

And what went wrong was the system bus which gave problems in highly unusual circumstances, and which led to deliveries being suspended until the problem was solved — taking two months. It affected cash flow.

The report which caused all the trouble (it was leaked to the *Financial Times*, says McHugh, by one disenchanted investor 'for whatever reason') was actually commissioned by FTS itself, in order to convince the investors that the rights issue was worth digging into their institutional pockets for. Finniston says he'll send the investors the Coopers' bill.

## Looking for future returns

I do hope that when I tell you that Future Computers has raised a million pounds from its backers, you don't say instinctively 'But you've already told us about that, and wasn't it £427,000?'

Future Computers is a quite separate company from Future Technology Systems (FTS), and was at some pains to point this out when it made the announcement. It described FTS as 'troubled', which I suppose is fair.

Future Computers is a company which shares people and investors with Encotel, which distributes its machines.

It has raised another £1m from backers who include Memorex and APA Venture Capital.

Future is banking on enormous sales of its networking equipment now supplied as part of its FX range.

Bob Jones of Encotel, a co-founder of the company, has announced that Future expects £10 million worth of sales in 1984, but that networking installations will account for 90 per cent of sales during 1985.

If that turns out to be more than optimism, it will be the first time networks have made such an impact on the market. Alternatively, Bob could be trying to say that ordinary hardware sales aren't going to be very good, I suppose.

## Finding out who's boss

BOS, or Business Operating System, is the 'top-selling business operating software'.

How do I know? Because Encotel, which is now selling the operating system on the Future FX range, says so. I rang Encotel to ask how it knew. The company offered to call me back with the answer.

After a couple of hours a phone call informed me that it was 'believed to be the top-selling,' and was 'definitely the top-selling British' operating system.

Well, despite all my friendly scorn over the years for multi-user systems in the micro world, BOS does still seem to be around and making some money for MPST.

The interesting thing about this announcement, however, is the news item ('Looking for future returns' — above), suggesting that FX machines are going to be sold primarily as network machines. A multi-user operating system on a networked micro could be quite useful in some offices.

BOS has made its own announcement about this, with a product called BOS/LAN, which links micros running BOS/5 and MBOS/5.

But BOS/LAN is not FX's local area network. It is aimed at linking any combination of Dec, IBM and Logica micros, with Ethernet as the network method.

'All the sophisticated multi-user features for file handling — shared access and exclusive access — are available across the network in exactly the same way as on a computer running MBOS/5,' is the claim made by MPST development director John Johnston.

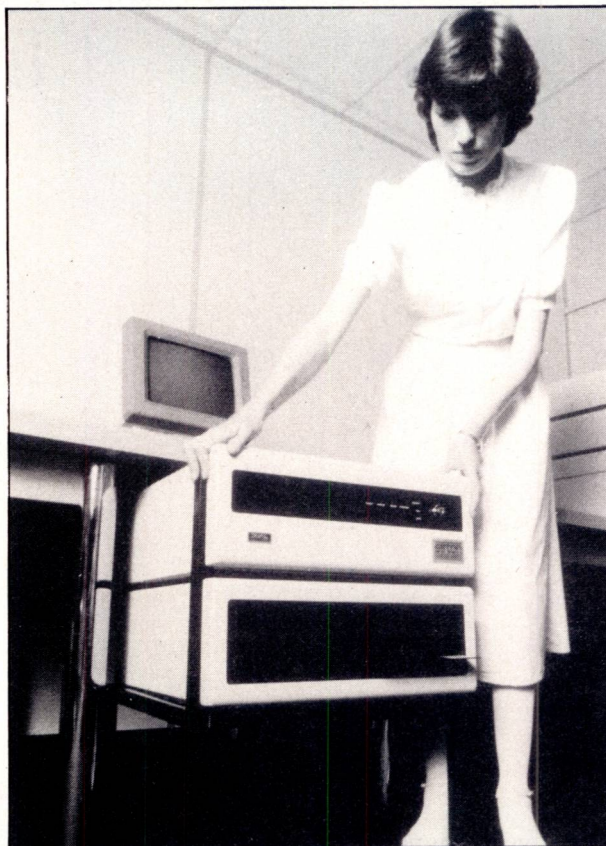
Details from Encotel on (01) 686 9687, or MPST on (01) 831 8811.

## Colex taking the fast bus?

Just for comparison with the big Unix beast from Sirton, there is a £1000 system with the same chip, launched by Colex.

It's equally odd, in the sense of using a system bus which was designed for an 8-bit system — it has the STD bus which is meant for the Zilog Z80.

First version of this machine,



*This is a Unix super-micro, introduced by Sirton Computer Systems. It's unusual among Unix beasts, because it is based on the original S100 bus, which was used on the first micro, the Altair. It is also unusual in using the very old Version 7 or the slightly less old system III releases of Unix, which you don't see anywhere except in Xenix, these days. But there it is, priced 'only' at a half to a third as much as a VAX class scientific workstation, according to the company, and (it says) equally powerful. It has a Motorola 68000 chip in it.*

Details on (01) 640 6931.

the STD68000, was sold as having three times the power of the Z80 processor: this version, the STD6800-8 'is expected to well exceed this,' says Colex.

The £1000 buys you not only the processor, but a twin serial and single parallel interface board, a memory board with 64k (you'll need more) and something called the STD PSID, which must be necessary, but about which no information was available at press time.

The company reckons this is 'an environment suitable for CP/M68K,' which makes the Quest offering (see 'Quest for QL disks') look like a bargain, if it comes. Details on (0990) 23377.

## Quest for QL disks

Disks are coming for the QL as two firms are out to offer an

operating system on Sinclair's new super-micro. They are working on the theory that QDOS just isn't up to it.

One of them will be available with diskettes, as well as for microdrive users.

The other is actually the operating system which we all saw demonstrated in January, when the QL was launched.

Disks are to be launched by a company, Quest, which has taken out a licence for the 68000 version of CP/M — CP/M 68k.

'The idea is to complement QDOS, not replace it,' said an official Quest source, tactfully enough — but the effect was rather spoiled by the next comment: 'We don't regard QDOS as proven.'

Director Ralph Warren explained that the company, as a supplier of diskette drives, was primarily interested in getting people to buy disks. 'But we would worry about selling disks to people using QDOS, because there might be





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complaints about the disks which were actually caused by operating system failures.'

The Quest disks will not just be ordinary 5¼in drives. There will be hard disks, 3¼in Sony drives, and even 8in disks, for those who want to read IBM 8in mainframe disks.

The company wasn't sure about price, but will start off with 200k drives, which are pretty cheap these days. And since the operating system on microdrive cartridge, or on plug-in ROM, will be around £50, a disk subsystem for £300 is feasible.

The rival system is the one produced by GST to order by Sinclair. It was turned down because it wouldn't fit inside the QL together with SuperBasic.

Since Sinclair's own 'AH' version of QDOS had the same problem (as everyone knows, now), the people at GST somewhat understandably feel that the real reason was 'NIH syndrome'—Not Invented Here.

GST also points out that its operating software does proper concurrency for Basic users—you really can run several Basic programs simultaneously, in different parts of the screen. That was the feature which really impressed me about the QL when it was launched—and even the new 'JM' version of QDOS written by John Matheson doesn't do that.

This program is called 68KOS, and its only real drawback is that you don't get it free with the QL—instead you have to plug in a new ROM.

Expect to see reviews of this in a month or two, when evaluation samples start reaching the Press. Or, in other words, don't expect to buy it for a few months.

## PC Junior growing up quickly

What people originally wanted from the IBM PC Junior was something like the IBM PC, but cheaper.

That, of course, was what IBM was originally determined not to provide—but it has now changed its mind, by announcing (in the US only) a version of the Junior with a proper keyboard, a lot of internal memory, and a fast RAM disk. There is also a speech synthesis chip.

At the same time, Lotus has announced a full-scale version of its runaway best-seller business program, 1-2-3, for the Junior—in ROM form.

Suddenly, the machine is worth taking seriously.

Official sources 'refused to speculate on future announcements' about when, or if, the machine might be released in Europe.

When the announcements were made in New York, IBM also released details of a very ambitious 'Writing To Read' piece of software, designed to teach literacy to kindergarten children.

The educational package may cause quite a stir in the US because they do at least have Juniors there, on which they can run the thing.

It sounds impressive enough—it is backed by official research showing that 'kindergarten and first-grade children can type whatever they can say.'

In effect, IBM is claiming to be able to teach literacy to most five-year-olds.

An official source in Boca Raton, headquarters of the PC group, told me that normally, educationalists would expect a typical kindergarten child with a vocabulary of 2000 words, to be able to read and write about only 100 words out of that 2000.

'We're saying that independent tests show that they can type a word, and once they can type it, they can read it, too.'

For the industry, however, the potential of the Junior in education is likely to be less interesting than the possibility of selling Juniors to business users.

The new keyboard will make a big difference—it is exactly the same 66-key layout of the old Junior keyboard, but uses entirely normal keys.

And, best of all to disgruntled users (but not to the makers of add-on keyboards, of course), IBM will provide this new keyboard as a free upgrade.

That means that anybody with an IBM PC Junior can go into any IBM retail outlet and get their new keyboard for nothing.

The really exciting move, however, is the RAM disk. It is provided by software, together with any 128k memory block—up to four blocks can be plugged into the parallel expansion port.

Not until you've used a RAM disk, will you realise how much time you spend in front of a computer, twiddling your



*Everybody expected IBM to have something new to say this August at a party held to celebrate the PC's third (American) birthday—but nobody expected the company to have quite so much up its sleeve.*

*Starting from the top, there was a new multi-user micro, the PC/AT, backed up by the Xenix operating system; a windowing program called Topview running on most of the now extended PC family; and some networking suggestions to hold the whole thing together.*

*The new machine comes in two models—one at \$3995 with 256k of RAM and a 1.2Mbyte built-in floppy disk drive, and the other at \$5795 with the same size floppy drive but double the RAM and a 20Mbyte hard disk.*

*The ATs were launched not long after the upgrades to the PC Junior were announced, putting question-marks over the future of other machines in the PC family. IBM itself did little to remove such doubts, pointing out that the new 80286-based machine 'delivers almost five times the user memory and more than twice the information storage capacity previously available on IBM PCs'—adding, for good measure, 'and, in most cases, system performance is two to three times faster.'*

*IBM only promises that the ATs are 'compatible with most existing IBM Personal Computer hardware and software.'*

*Unsurprisingly it's more confident about PC DOS Version 3.0, another of the new launches: 'This version has added functions to support the new Personal Computer AT hardware and is compatible with all IBM PCs.'*

*But it's the IBM PC Xenix operating system that gives the ATs their multi-user capacity as it allows two terminals to share one AT's processing power. The operating system also allows more than one task to be handled at a time by any of all of the three users.*

*It's the multi-user ability which distinguishes Xenix from IBM's other, earlier offering in the Unix field, PC/IX, a multi-tasking but single users system.*

*Both of these systems are, however, based on the System III version of Unix—at a time when AT&T, one of the few companies equipped to fight it out with IBM, is heavily promoting System V.*

*The new windowing program, TopView, runs on the AT, as well as on the original PC and the hard disk and portable versions. Priced at \$149, this package allows users to run more than one program at a time, switch from task to task, or display data from various applications on the aforementioned windows. Junior has been left out in the cold for the networking as well. IBM is selling various components such as network adapters and cabling kits enabling users to install their own networks linking up to 72 PCs, XTs, Portables and ATs.*

*If you want more, the company is also releasing specifications enabling third-party specialists to link up to 1000 members of the family. IBM aims to connect these systems to its projected token ring local area network.*

*The ATs are available now in the US, TopView is scheduled for early next year and the PC Network for this October. There was no word on UK prices nor availability at the time of going to press.*



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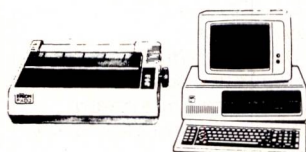
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**IBM PACKS 3 & 4.** PC XT, software. Daisy printer at no cost.



## IBM PORTABLE PC

**JUST ARRIVED!** New from the USA is the Portable PC. Two slimline disk drives, 9" amber graphic display, lightweight keyboard that hinges on the main unit, the ability to run all of your PC software, and portability so you can run with it. Adding a new dimension to computing, the Portable gives you everything you want from your PC, in a 30lb takeaway package. Colour adaptor, 256K RAM and 5 expansion slots provide versatility with that all-important IBM badge on it. Drop by for a demo. Pick up a leaflet, then the computer.



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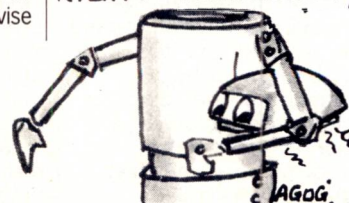
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fingers.

It isn't just when you load a program — though goodness knows that makes a difference enough — but when it overlays — when portions of a long program, too big to fit into the normal memory space, are pulled in from disk and then are started up.

Most programs use this method of making sure that anybody, no matter how little memory, can run them, and most of them waste around three to 10 seconds on each overlay. With the whole program in RAM disk, it takes microseconds.

With Lotus 1-2-3 on a plug-in cartridge, however, the possibility arises that people will actually prefer to use the Junior instead of the PC itself. Loading time will be instant, and with the RAM disk for spreadsheet storage, the program should run like a train.

The new 'proper' typewriter keyboard is likely to go along way to putting smiles on the faces of US retailers. Many prospective buyers have given the horrible, Sinclair-Spectrum rubber keys as their reason for choosing something else.

Naturally there will be those in Commodore and Apple who may observe that the offer is only possible because there are so few users of the Junior already.

The bad news is the price: it isn't prohibitive, but an extra 128k of memory fetches \$325. That isn't cheap, when you consider that the 16 memory chips involved cost \$5 or less, each. And to go beyond the first add-on memory block, to the full 512 memory expansion, the buyer has to spend extra (\$150 extra) on a power supply expander.

And the price of Lotus 1-2-3 isn't reduced, either — on ROM, it costs a full \$495. But then, according to Mitch Kapor, boss of Lotus, it is a full feature 1-2-3, with no compromise on the code.

## On the road to success

The reason for dragging into the news an agreement by which Kalamazoo will sell Aston-built Pertec micros, is the operating system involved.

Kalamazoo makes its living selling in 'vertical' markets, mainly motor distributors, with purpose-built software running on very ordinary equipment.

The deal is centred firmly around the Pick operating system (major rival to Unix in multi-user systems), and though it isn't yet clear exactly how Kalamazoo will use this system, it is clear that the company has no intention of using any other.

Pertec designed the original 68000-based processor, and sells it, directly and through Kode, into the UK. It also granted a licence to Aston Technology which markets it, together with some Rodime hard disk drives and Aston-made terminals, as the Crystal range.

I really don't want to over-sell this story, because although Aston talks enthusiastically about the 'tremendous success' of the range, with orders over £700,000, you do have to remember that this amounts to only 70 machines.

And when Kalamazoo and Aston boast that the deal 'could be worth over £2 million in the first year,' you must remind yourself that this involves selling only 200 more.

Also, it isn't altogether clear that Aston and Kalamazoo have quite the same things in mind. Aston's managing director, Graham Gough, told me that he believes that Kalamazoo will sell this machine into such businesses as hotels, and the motor distribution business.

Kalamazoo's traditional market for business systems is in the motor trade. However, a spokesman for the company said that this would not be an automatic outlet for the Crystal machine.

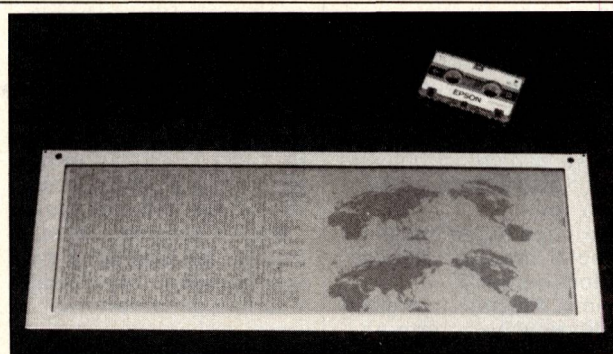
'Our motor trade division is autonomous,' said the executive, 'and this will be put forward as a multi-user option for them to install if they see fit.' The idea of doing hotel systems was also dismissed.

However, when Kalamazoo does start selling this powerful micro/mini, the software will be written in the Pick-based System Builder (a program generator developed in Switzerland by Atech-System Builder — reviewed in the June issue).

That program generator works only under Pick, and despite all the qualifications and reservations listed above, it is very interesting to see a deal so firmly tied to that operating system.

## Mutual support

It's always nice to get support for a product from an



**Epson is prepared to sell anybody at all a flat, LCD computer display — providing you have about £300.**

**It has launched a 25-line model, and hopes to have high volume units available to system builders (that is, people buying in lots of 100 or so) by the winter.**

**And by the New Year, even private buyers who want just one, will be able to purchase it, says Epson.**

**The unit is said to consume only 20mA off a battery supply, which means that it can be used in battery-portable computers.**

**But the new display cannot be bought as a simple CRT replacement by the amateur user. An interface to the normal video output of a microcomputer would be a highly complex bit of engineering — not something for a couple of spare evenings with a soldering iron.**

independent expert — but don't be deceived by Fox & Geller's enthusiasm for dBasell into thinking F & G might be unbiased.

Fox & Geller sells a product called Quickcode, which can be used by people trying to manage dBasell, the parent database. It helps prepare command files, which is a way of saying that dBasell is really a programming language, and Quickcode is a sort of compiler.

Not surprisingly, Quickcode has now emerged as a dBasell compiler, too. So has the utility pair of programs dUtil and dGraph.

And, guess what? 'dBasell will be the fastest and most powerful program of its kind,' says Tony Riley, managing director of Fox & Geller in the UK.

Riley is on (01) 580 5816.

not for bargain hunters.

It is one of the new briefcase-held knee-tops, following in the footsteps of Tandy 100 and competing with things like Osborne's Encore and Hewlett Packard's Portable 115.

But this one has a *big* chip inside it, not just the ordinary IBM or Sirius 8088, nor even the full-size 8086, but the bigger brother, the 80186.

It has the nice (I'd say necessary) feature of using battery-powered memory — so that when the power is turned off, the memory goes into trickle mode, and keeps its contents.

And it offers MS-DOS 2.0, which is stored in permanent memory. It even has an ordinary video display output, according to preliminary information.

What it doesn't have, unfortunately, is a diskette. True, it has memory which can be used as a disk, to make programs run faster, but that doesn't solve the problem of loading the things.

The only word of a diskette interface refers to 'disk drives for the office are available in an expansion unit which can pack an extra 256k of RAM.'

Compared with the Encore, this one at £2000 and with only an 8-line display, seems like a pretty pricey package.

Included in the package is a set of the expected word processing spreadsheet and communications software. These were written by Dulmont, because the software houses they asked to

## Things are different 'down under'

At the time when Epson is offering a 25-line LCD screen for £300, you might ask why the Australian micro, the Dulmont Magnum, comes with only an 8-line display, and the maker reckons that a mere 16-line display should cost an extra \$500 on the \$2500 US selling price.

The answer appears to be that Dulmont regards its machine as a bit special, and



handle the job pulled out.

The company's claim that 'naturally, any MS-DOS program can be executed onto the machine, — for example, dBase II, Knowledgeman, and so on, is the one which begs the question of whether you have disks or not.

Until the company finds a distributor, however, all these questions are purely academic. Anybody interested in getting involved on a more practical level has to contact the Australian Trade Commission on (01) 4388561 and ask for Peter Mott.

## Choice Apple

Pete and Pam is offering a disk drive for the Apple II. It is more compact than the outdated Apple drive (price £130 + VAT).

## On the treasure trail

Both hardware and software sides of our industry often take refuge from facts which seem uncomfortable, by indulging in what they might call exaggeration.

This has started to hurt the software business.

The software distribution business is not entirely devoted to weeping and wailing about piracy — there

are several of them who are taking a firm grip on the job of counting the money.

Specifically, there is to be an attempt to create an accurate 'top fifty' chart of games software, as opposed to the apparently random guesses which have dominated so far.

Market researcher Simon Treasure is probably right to say that the figures published in various parts are not as wrong as they look. But when one distributor has a top 50 which includes only 10 games from another distributor's hit parade, we aren't making sense.

The explanation, apparently, is that a good selling BBC program may still not make it into the top ten, simply because there aren't that many BBC machines. By contrast, a feeble Spectrum game may be quite a hit.

What the industry wants to know is: exactly how many machines of each sort are there? How many of the new machines are being sold each week? If a game sells 100 on the Amstrad a week after launch, is that to be expected? Or is it a flop? Or are there only 100 machines? Do the people who have ZX81s still use them? (Sir Clive uses them as door-stops).

Treasure is the man who draws up the Prism/MicroScope chart, and his plan is to get the industry to set him up as the coordinator of a joint industry Focus

Committee, along the lines of successful music record industry groups.

Accurate figures can only be obtained from the industry itself. But the trouble about the industry is its tendency, as hinted above, to tell lies.

They tell lies because it's important. A month after a machine is first launched, the flow of nearly-ready software can dry up in a week, if the software people are not convinced that it is selling. A fat lot of good it does launching Super-Zapp for the Swizzocomp if the only ones sold are trade samples. So, of course, Swizzo Micro Ltd will announce that it is delivering 1000 a week, even if it isn't true.

However, the hardware people themselves need to know what's going on, and Treasure hopes to use this need for knowledge in order to screw information out of them.

His theory is that if they all provide accurate sales figures, week by week, to an independent auditor, who publishes only the global figure, nobody will have to give away any secrets in public.

The idea is excellent. There is only one small hiccup, of course, in the fact that Treasure appears to have been a little more successful in selling this idea than perhaps he planned to be.

He has been asked, by leading software distribution representatives, to go away and make concrete proposals for market research and statistic coordination, to be organised by himself.

But the software distributors have added the 'of course' rider that he, obviously, can't bid for the market research contract, if he's drawing up the terms.

Which will suit him very nicely, one day — but not just yet! At the moment, his sole source of income is the market research work he does on games software . . .

## Fast action on anti-counterfeiting legislation

There really is no hope that individual computer users will stop asking each other for a copy of whatever software they notice their friends using — despite the recent success of Trevor Brownen's criminal suit

against Yorkshire Software.

And, as the industry is at last realising, action must be taken to change the law.

There was excellent news for software writers in the judgment on Howard Austin, who was found guilty on several charges, all related to his selling of Crystal Software packages which he hadn't obtained from Crystal.

Crystal now hopes to sue the 19-year-old manager of Yorkshire Software for the £40,000 worth of lost sales the company estimates he cost them.

But the judgment, in a court in Devon, isn't quite what it seemed when it was greeted by one enthusiastic headline writer with the loud pronouncement: 'Software piracy a criminal offence!'

What the judgment actually proved was wrong *wasn't* software piracy — Austin wasn't charged with that. He was charged with selling something under the name Xtal Basic, selling manuals appearing to be Xtal Basic manuals, and passing the software and manuals off as genuine Xtal Basic, when he knew it was merely a copy.

Trevor Brownen, boss of Crystal, specifically did not attempt to claim copyright on the code itself.

The result is that nobody has yet established what would have happened if Yorkshire had just re-issued the software as 'Yorkshire Basic' — and those in the know seem fairly convinced that new laws would be needed to stop them.

Anti-counterfeiting legislation specifically for software *has* taken a real step towards the distant goal of a statute, with the reading of a Bill in the House of Commons.

That Bill was drafted by FAST — the Federation Against Software Theft — and stands almost no chance of being passed at this stage.

'The important thing is that introducing a Bill under the 10 minute rule gives us a mechanism for getting it printed and distributed among MPs,' commented one of the backers, Randal Robertson (*sic*), who is chairman of the CSA's legal affairs group. The object of FAST's action is to get a Private Member's Bill put forward — and they are due to put their names into the lottery hat in October.

Whichever MPs get picked to put forward a Bill, there will be some without a burning urge to pass a law on their own

*continued on page 99*



**At last, Wrens are being built. After the delay, it seems only right that all the stops should be pulled out, and indeed the company reports that they are.**

**The Prestel-based portable CP/M system is built at Thorn EMIDynatel's Treorchy plant, and the factory decided to stay open during the normal summer shutdown period, working to maximum capacity 'because general demand is so strong,' according to Prism.**

**How nice. And what a shame that the publicity had all been so effective, that I really was expecting to hear of enormous numbers built. In fact the holiday shutdown would only have lost production of 400 machines. I suppose that's impressive, but really, all the ballyhoo had led me to think in terms of rather more.**



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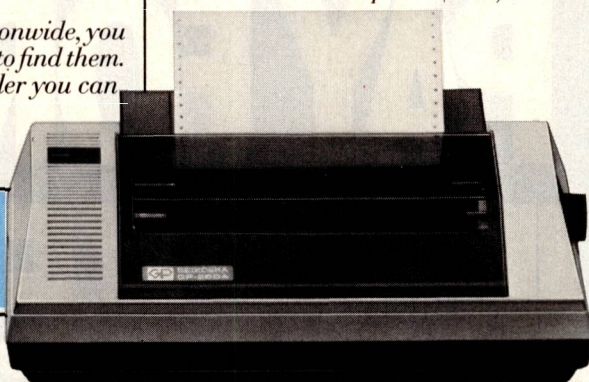
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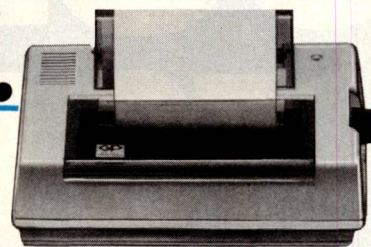
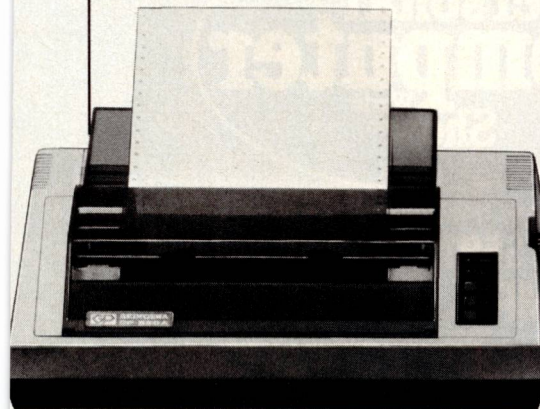
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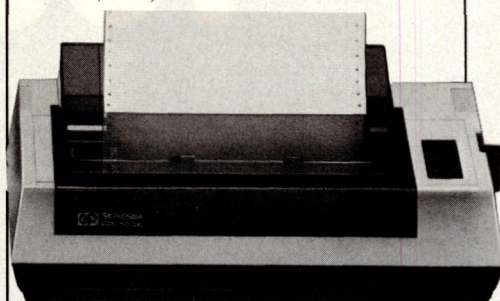
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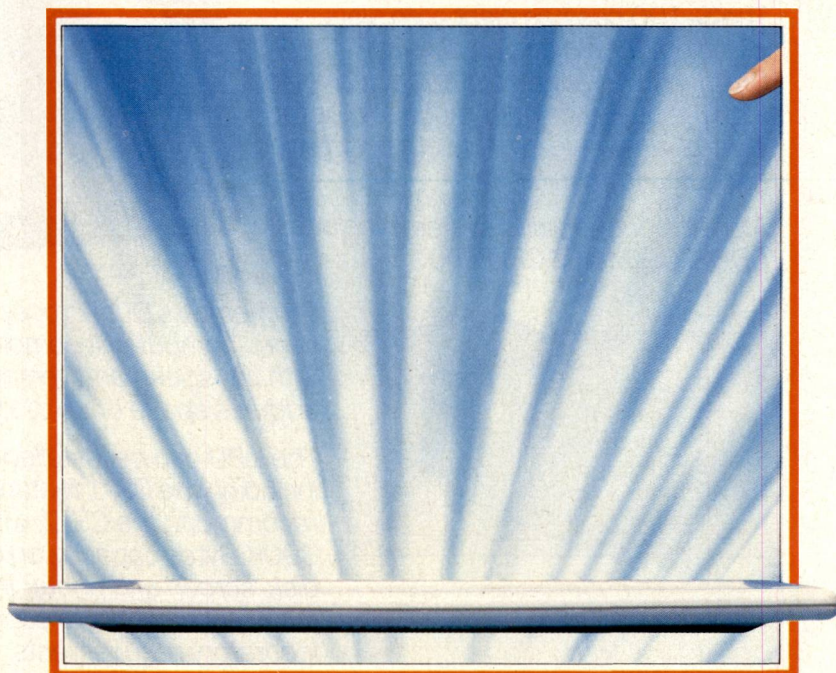
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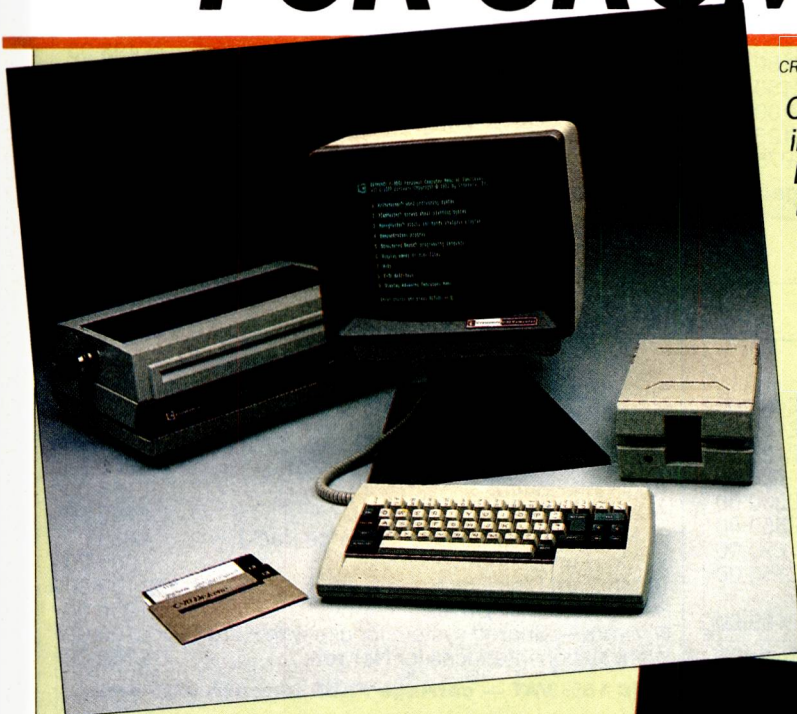
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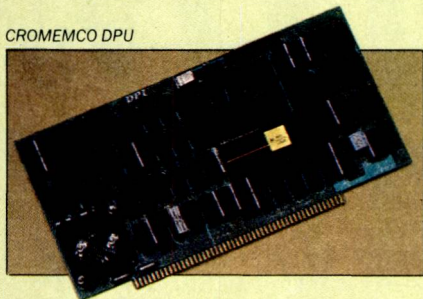
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continued from page 94

hobby-horse subject, and who are just looking for something worth doing, preferably with a chance of receiving support from either side of the House, and likely to get their name into the history books as having put forward the new law.

Ronald Robertson of the CSA was pleased enough with the conviction in Devon, but pointed out, soberingly, that the defendant was fined a total of £40. That, with costs of £50, was the only criminal penalty exacted.

Robertson commented: 'If we had been talking about music or video tape copying, it would have been appropriate to expect fines of several hundred pounds.'

FAST is still hoping to get new legislation in 12 months.

## Logica's version of events

Nice little touch of irony in an announcement from Logica, which sells Xenix (Microsoft's venerable version of Unix, now hopelessly outdated by developments from Bell) in this country.

Logica has been given the job of moving Berkeley release 4.2 (a much later version) of Unix onto the Norsk Data ND500 minis.

Considering how disparaging Logica was, only a month or two before, on the subject of Berkeley Unix compared with its own 'much more powerful' Xenix, it was lovely to watch the careful way the announcement praised 4.2, without in any way allowing

comparisons to be made in the reader's mind, with Xenix itself.

Instead, Logica compared it with Ultrix, the version you get on a DEC VAX. Hohum.

## Paying the difference

A Sony 3½in disk drive is about to appear on the Electron, courtesy of Acorn itself. And from Sir Computers, there will now be a Mode 7 adapter. It can make the machine almost as good as the BBC Micro for roughly the same price.

The Acorn device is still unpriced, and nobody quite knows when it will appear. What makes it interesting, however, are the hints emerging from Cambridge that it will be available on the BBC Micro, too — with a totally new diskette operating system.

Word was that the Electron device, including interface, would appear this month.

Sir Computers, an independent supplier, claims that its adapter saves at least five kbytes of memory, when running BBC Micro programs that use the Teletext mode 7.

Normally, this very economic mode (in memory terms) is fudged by the Electron, and the result is that quite a bit of software won't work.

That remains true, unfortunately, with Sir's device, which the company claims 'is compatible with over 90 per cent of BBC Micro mode 7 software'.

Once you have plugged this



**Half the time you think you went into WH Smith, chances are you were in a Menzies shop — so it comes as no surprise to find that a company, like Smith's, is selling software and doing it down the phone lines.**

**Like the Romox system being tested by Prism, the Program Express machine from Palo Alto company ITS (Inventory Transfer Systems!) loads programs into ROM cartridges. But this one can also do disks and tapes for non-cartridge machines like Apple and BBC.**

**For the moment, this is experimental — Menzies won't decide for a couple of months whether to make this method of software distribution the standard one.**

**Inventory transfer indeed!**

£99 device in, plus the Acorn joystick interface, you have come so close to paying the full BBC Micro price that I really don't understand why anybody would want to make the 'saving'.

For those already stuck with an Electron (and Acorn believes there are some 150,000 sold) Sir Computers is on (0222) 621813.

company claims, and quotes software brand names like Peachtree, Systematics, Jarman, Omnis 3, Ormbeta, Busifile, Jack, Aladin and Ferox Modeller, to prove that the system is much used.

Details from retailers, or on (0272) 742796.

## The Evil 'Dread'

Launch of *The Evil Dead* as a video game nasty was rather spoiled recently when the Commodore 64 version crashed.

The blame was with Palace Software, which developed the program on a Commodore 64. As a result, when the system crashed the night before the launch, the company didn't know.

The Commodore 64 disk system is without any doubt the worst in the world. With the new chocolate drives, it has at last got round the trivial problem of saving programs on top of others — but with a white drive, you still run the risk of saying 'save FRED' and finding that the new version of Fred, being longer than the old, has run beyond the old one, and over the first part of the next program on the disk.

Such a trap did Palace fall into.

The company asked why on earth it didn't just dig out the backup diskette — surely it had made one as soon as it had got



**Screendump printing at the touch of a button is one of the attractions of the Janome CP1018 printer from Thame Systems. This seven-colour printer costs nearly £900 and operates at 90 characters a second in near letter quality or 180 in draft quality. Screendumping is done through an optical RGB video interface which costs an estimated £45.**

**Thame can be contacted on (084) 421 5471.**

## Last laugh on ACT

After having been a little rude recently about ACT's ability to be last with a software package, it seems only fair to add that the company has announced both Framework and dBase III for the Apricot range. Not that I've actually seen a sample yet, but at least ACT has made the announcement.

## Much sweeter Apricot

Pascal on the Apricot now includes the original, portable UCSDP-system, following a release of the operating software by TDI of Bristol.

'Apricot users can now swap from MS-DOS to P-system, and share the hard disk,' the





# What some people do when they buy a computer.

Buying a computer that's right for your business is often a matter of luck.

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the thing right?

'No, because it takes 45 minutes to copy a diskette on the Commodore drive,' said a rueful Richard Leinfellner, the programmer.

If you don't have a 64, I bet you think he was joking.

## Technical indigestion

Should you be drawn into an argument with a technology freak who tells you that 'silicon chips are finished, and it's all going to be gallium arsenide,' drop this little fact into the argument.

'A three-inch GaAs wafer still sells for fully 20 times the cost of a four-inch Si wafer.'

The information comes from a comprehensive, very informative report, explaining exactly what gallium arsenide can do, and what silicon can do, and why.

The report is published by IPI, and was prepared by a research group called Eurogestion KK, in Denmark.

And it suggests that nobody at all will be using this technology for super-fast (or super low power) semiconductor chips in computers, until well into the 1990s.

It also suggests that the power-saving features will be irrelevant for some time, since most circuits built with this technology will have to share cabinet space with hot silicon chips doing other (irreplaceable) functions.

And memory chips built in GaAs will be small, and not very fast, for some years.

The only drawback to the report is its \$995 price—but for anybody planning things looking ahead 10 years, I suppose the cost can be justified.

Details on the Denmark phone number 45 2 63 20 44.

## Getting the sums right

An accounts program isn't always cause for comment in these columns: the reason for mentioning one, from Logical Step, lies in the trial offer the company has proposed.

For one month, prospective users can try out the 'fully integrated' C/FACC program for £50.

This trust of prospects is probably going to cause amusement at rival offices,

where they will assume that people will simply make a copy, and send the £600 diskette back 'unwanted'.

Of course, many accounts programs suffer this fate anyway—on this occasion, however, the company will at least get £50 for its pains.

And it may make a few sales, too.

The main technical feature of the program is that it is not, as normal accounts packages are, a set of separate programs which can cooperate. It is one complete program for invoicing, ledgers, stock control, and so on.

Details on (0789) 842082.

## Soft sell technique

A price cut on WordStar isn't to be expected in the everyday course of things. What MicroPro has done with its product, instead of that, is to package it for IBM family users together with all the subsidiary packages that some WordStar users buy.

So when you buy WordStar Professional you get all four—Mailmerge, StarIndex, and CorrectStar (a new one)—all for the £400 price.

The only snag, perhaps, is the thought that you mightn't have been going to buy anything other than WordStar...

Details of the offer will be displayed in the shops.

## Micro with a silver lining

Silver Reed has built a computer for word processing, which uses an ordinary typewriter (well, ordinary electronic typewriter) as the keyboard and as the printer.

The company describes this system as 'automated typing the way a typist would like it, rather than as a completely different activity.'

The system not only works with Silver Reed typewriters but will function happily with Olympia and Olivetti machines, too.

And the software chosen to drive it is Lexicom, from Dutch-owned software house MicroTrend.

## Double the fun!

After the farce reported last month with DoubleMode, the company which took ex-rental

sets and turned them into computer monitors, I was looking forward to telling readers how the happy end came.

The company had sent me an enormous coffin with

enough CRT glass for a shop window, and it broke down on the second day of use. It had boasted about the repair deal it had struck: I was waiting for the 'factory holiday' to end so that we could investigate just



**A genuine local net can link different makes of micro—and on that basis the British designed Cachenet from Eicon Research is a real local net.**

*It was launched first in the US, because (in the words of managing director John Hartley) it was important to judge the network's ultimate potential before launching it. That meant its potential in the US.*

*Eicon Research is based in Cambridge, and the breakthrough which its research people believe they have made is the use of a 'cache' of memory, holding the information most likely to be needed next on the network.*

*And it can be used by multiple users, with Apple IIe, NEC APC and IBM PC micros, altogether.*

*To quote the company's own theorising: 'Most business applications are disk-bound. This is to say, most of the time you sit waiting for things to happen on a micro, it's probably not because the processor is struggling to calculate something or locate some data. It is probably waiting for the diskette head to find the right track, then the next one, and then the next one... and so on.'*

*Hard disks, says Eicon, 'are fast compared with floppies, but still, RAM is 1000 times faster.'*

*It takes a mere 256k of extra memory to give Cachenet something like 10 times the speed (it claims) of rival nets—that is, the 'in use' speed, not the raw data transfer rates.*

*This 256k is used to store the most frequently requested sectors of data from the network disks, and 31 sectors next to any requested sector are also stored.*

*Software to run on this network is still not appearing at one program a day (IBM's current claim for the PC) but as tart has been made.*

*'Several multi-user software packages,' says the company, 'including the databases Omnis from Blyth and Dataflex from Equinox, are already available, and both single and multi-user software can easily be adapted to run on the network.'*

*The reason so little has been heard about the system isn't the fact that it was launched in America, however. It's the fact that the company launched it on the NEC machine alone.*

*Only more recently has the Apple been added (under both ProDOS and Dos 3.3, by the way) and the IBM.*

*Price starts at £2000 for a 10Mbyte disk, plus £245 for each interface. Software is £400. So for five micros and 10 megabytes, the total would be £3850, says Eicon.*

*The company is chaired by a man who is a celebrity in his way—Dennis Taylor, who was managing director of Hewlett-Packard until last year. And, it adds seriously, it has an equity investment of a million pounds from the Norwich Union.*

*Details on (0954) 81825.*





**IBM may have picked exactly the right time to launch its portable version of the PC into the UK, if information from inside Commodore is true.**

Reports from unofficial sources suggest that the Hyperion-based Commodore PC will now be cancelled, and that the emphasis will switch the machine with a Zilog Z8000 and a Unix-type operating system, which isn't expected to be ready for at least six months.

IBM's portable isn't immediately impressive on its own, since it is one of the least 'compatible' of the compatibles.

It has its own operating system, Version 2.1, which will not run the standard versions of many popular programs.

When it was released in the US earlier this year, its arrival was anticipated by pundits, who forecast an end to the Compaq bonanza. Compaq got to be the fourth-biggest US micro company by selling a portable version of the PC, and, it was argued, why would anybody buy a 'fake' when the real thing became available?

It didn't turn out like that. The Compaq isn't cheap, maybe, and it isn't exactly the same as the PC—but it is cheaper, and lighter, than the IBM Portable. And it is more like the original, since IBM has fudged the new version in order to put both colour and monochrome screens onto the same display.

In the US, (Compaq says) sales have heavily favoured Compaq at the IBM's expense—and (naturally) the company expects the same thing to happen here.

'The Compaq offers a dual-mode, high resolution text and graphics display screen, more expansion card options, and a 10 megabyte hard disk version,' was the way UK Compaq boss, Joe McNally put it. 'None of these is available from IBM.'

## A small price to pay

As regular readers of PCW will already have noticed, this magazine has been unable to resist the pressures of inflation. Our cover price last went up in January 1983, but it's now gone up from 85p to 95p. We won't bore you with details of why, but we hope that the contents of the magazine and its size—more than 100 pages of editorial—still make it good value. Readers who think otherwise should contact our Communications page as soon as possible. Subscription rates remain unchanged.

how fast this repair service worked.

Apparently there is no happy end. DoubleMode has ceased trading, according to the Irvine Development Corporation, and there is no chance of recovery.

Apparently there was no 'technical' reason for failure—which my experience doesn't altogether bear out, since the one I bought not only died, but killed my home power supply system and four fuses, too.

But the people who were so eager to publicise their new start-up company proved strangely reluctant to explain why it had died. 'You should write to the company,' they suggested. 'It wouldn't be appropriate for us to comment.'

## Life after Valhalla

Legend, the company which won the BMA 1984 Game of the Year award for Valhalla is releasing a contender for the 1985 award.

The Great Space Race is a real-time arcade strategy game where you compete in a race across space in which anything goes.

Although games will be brief compared to Valhalla standards, Legend claims that it is continuing the movie style development which started with Valhalla. For instance, The Great Space Race is to include full facial animation of characters you meet.

According to Legend it took seven to 10 man years and a £1/4m to develop The Great Space Race which is being launched simultaneously for the 48k Spectrum and the Commodore 64. Ironically, it was developed using expanded BBC Micros, but there will never be a BBC Micro version as the basic machine hasn't the memory to handle such a game.

## Throw away the Ace!

Even at £26, it seems, they still can't get rid of the Forth-based Jupiter Ace.

An announcement, virtually a repeat of one issued two months ago, has reached me saying that 'the Ace is not dead!'—with the additional information that there is a range of new accessories available.

Boldfield Limited

Computing is offering various package deals on software and hardware—a pack of six games, for example, for £4.40, or a 16k memory add-on for £8.

Examples of new hardware include a motherboard, which lets Jupiter users plug in Sinclair or Memotech memory packs, keyboards, or printers—at £12 plus VAT. There is a joystick interface for £17 plus VAT, a sound box for £34 plus VAT, and a new keyboard for the same price.

Be warned, however, that not all these products are gold-plated, Conran-look, space-age home accessories. 'We are confident that you would prefer our DIY approach, with some products uncased and others requiring soldering, to the alternative of paying much higher prices for identical accessories dressed up cosmetically to match the host computer,' the company says—and it has probably judged the nature of the typical Ace buyer accurately.

Details on (0487) 840740.

## Musical chairs at Atari

Contrary to much-published rumour, John Baxter has not joined rival Atari. The idea that he might have followed Commodore founder Jack Tramiel to Atari probably arose because one of the new Atari bosses is indeed a Commodore man.

David Harris is now the man responsible for Atari's sales and marketing outside the US—and Harris had been a sales and marketing executive at Commodore.

People leaving Atari, now that Tramiel is in charge, include Graham Clark, the former boss, and marketing director Andrew Swanston. Tony Adams, sales director, has also left.

In the gap between Clark and Harris, the shop was minded by financial director Simon Westbrook—and he is staying on as general manager for the UK.

The new managers have new prices to play with in their efforts to sell Atari machines. The 600XL has had £60 lopped off its price and is now down to £99.99. The 800XL moves down to £199.99 from £249.99.

The two printers have come down by £100 each while £20 is the reduction on the Trak Ball and Touch Tablet. Most interestingly, Atari soft titles now come in under £10. **END**



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- Depreciation** – straight line reducing balance lifetime estimate depreciation charge schedule book value schedule

#### SCIENCE



- Physical Constants** – Planck, electron mass, electron charge, Rydberg, Gravitation, Avogadro, speed of light, sound. Gas constant, permeability, permittivity, earth radius, Bohr radius, Astronomic unit, etc.
- Conversion Factors** – UK to MKS etc.
- Formulae** – LC circuit, Lenses, Bohr energy levels, Larmor, plasma, etc.
- Integration Under a Curve**
- Least Square Fit**
- Solution of Polynomial Equations**

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#### MATHEMATICS



- Bessel** – functions
- Polynomials** – solutions of equations
- Matrices** – solution of matrix equations
- Integration** – Eigenvalues
- Curve-fitting** – under a curve
- Statistics** – least squares
- mean
- standard deviation
- Chi-squared

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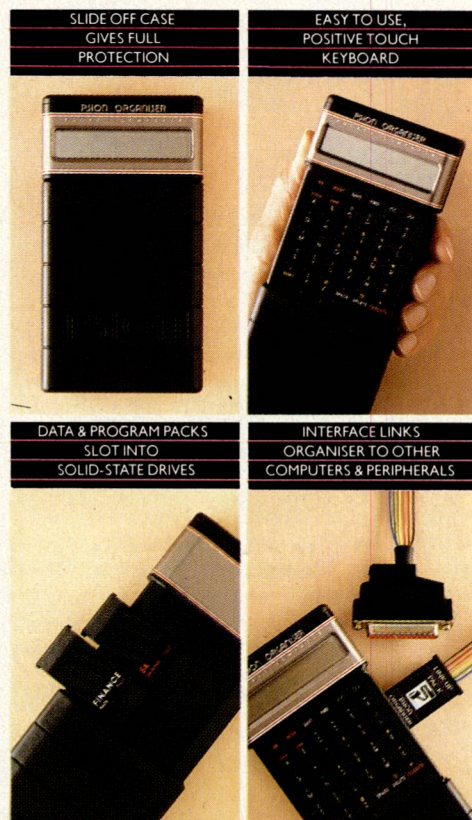
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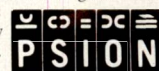
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Expansion is no problem with the MTX Series, because it is designed as an interlocking system – from the MTX512 up to the powerful Memotech Silicon Disc Systems.

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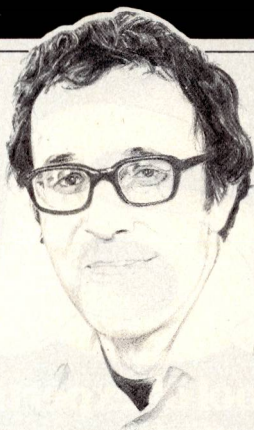
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*David Ahl reports from the States on the speedy next generation Macintosh, the unisex Amiga PC, the failure of Unix to catch on, and computer policy.*

## Next generation Macintosh

Although the Apple Macintosh has all kinds of advanced features and boasts a 32-bit 68008 CPU, users have complained right from the start that the Mac is slow and doesn't have enough memory. Thus, while the machine has been shipping in quantity for less than a year, insiders are already talking about the next generation Macintosh.

Much of the speed problem can be attributed to swapping programs and data to and from disk, so the new Mac will have a second 128k ROM which will contain much of the software now on disk.

Furthermore, the 64k RAM chips will be replaced by 256k parts from Japan, thus quadrupling the basic machine's RAM capacity to 512k. It's likely, too, that the new Mac will have a true 32-bit bus rather than the hybrid 32/16 bus found in the present model; this too should increase processing speed.

Two companies have already announced winchester hard disk drives for the Macintosh. Tecmar has four versions of its MacDrive: a 5Mbyte unit with a removable cartridge; dual 5Mbyte units; a 10Mbyte fixed hard disk; and a combination 5/10Mbyte unit. Davong offers six versions of its Mac Disk system with capacities of 5, 10, 15, 21, 32, and 40Mbytes; all are fixed disk systems. Access time of both the Tecmar and Davong units is about 75ms.

## Foreign policy

In an effort to keep computers with possible military applications out of Soviet hands, the US Government is now monitoring all computer sales to foreign countries, even allies. The Commerce

Department requires all exporters to have a licence, and any case that seems less than routine is passed on to the Department of Defence. The Customs Service is considering a scheme that would require manufacturers to install electronic bugs in computers, so they could be traced if they were smuggled out of the country.

Defence Department officials are convinced that even the current controls are inadequate, and are holding classified briefing sessions with industry leaders to try to convince them of the severity of the problem.

However, many manufacturers feel that the restrictions will mainly hurt exports while doing little to keep computers out of the hands of the Soviets. The prevailing feeling is that the Soviets will get around the regulations either by smuggling in US-made computers, or by buying similar systems from Japanese manufacturers.

Executives point out that European, Japanese and Taiwanese desktop computers are readily available in the Eastern bloc. People simply buy the systems they want in Vienna and truck them over the border to Budapest, now the personal computer capital of the Eastern bloc. 'It's absurd to think the Government can stop that kind of traffic,' said one manager.

## Amiga PC: the continuing story...

I mentioned the Amiga PC several months ago (*PCW*, May), but the final prototype looks even more interesting with its built-in unisex speech. It's based on the 68000 CPU, has 128k, a disk drive with 320k capacity, composite video and RGB output, a detachable keyboard, stereo sound (with four channels), parallel and serial ports, a bus connector and joystick ports.

Graphics and animation are superb. Low resolution is 320x200 pixels with an astounding 4096 colours, and a high resolution mode of 640x400 provides 24 colours.

A frame buffer and sprites produce high speed animation in low-res mode. In addition, the system allows simultaneous vertical scrolling, horizontal scrolling, and animation of images.

The Amiga proprietary operating system is window-based, although the unit can also support CP/M, MS-DOS, and the P-System. A 'speech lab', incorporating both male and female voices with an unlimited vocabulary, is built in.

Amiga also promises 20 applications software packages upon release of the system in the autumn. Price is projected to be \$1500.

## Miss for Unix

Not only will Unix fail to become an industry standard, but it will also achieve only a very modest market penetration, according to a recent study by International Data Corp (IDC). These conclusions, from an initial study conducted in February, have been reinforced by subsequent interviews with end users, OEMs, and vendors.

The main reason for its lack of success is that its cryptic command structure is difficult to use. While Unix could be made more friendly, such a transformation would lead to a loss in efficiency, one of the major advantages of the system.

Furthermore, Unix is inefficient for small systems, according to the study. Some software developers have reported that Unix programs on small systems actually run slower than with standard operating systems.

A third limitation of Unix is its lack of standardisation. Although AT&T designed the system to be standard, several implementations including Version III, Version V, the Berkeley Version, and Xenix have cropped up.

Another problem with Unix is that it tends not to be easily transportable across different microprocessor architectures; different implementations are required for 8088/86, 68000, and 32032 CPUs.

A final problem identified by IDC is a lack of applications software that runs under Unix. It lacks the ability to support integrated database

management systems, integrates communications and resource servers, and cannot accommodate advanced graphics packages, therefore few software developers have produced packages for it and they seem to be disinclined to do so in the near future.

Interestingly, the major commitment to Unix is by hardware manufacturers, a fact which may lure software developers to produce software for the system. Nevertheless, the report concludes: 'There is no more reason to believe Unix will become a standard any more than any of the alternatives will become standards.'

## Random bits

Warner Communications sold Atari to Jack Tramiel for no cash down and \$240 million in promissory notes. Tramiel, former president of Commodore, dismissed the entire marketing department but has not revealed any of his future plans yet... Gavilan is finally shipping two versions of its notebook computer some six months late. An ominous note is the company's return to the venture capital market for another \$15 million...

Franklin Computer, maker of the most successful of the Apple work-alikes, has filed for relief in the Bankruptcy Court under Chapter 11... Software vendors, particularly those with extensive commitments to Atari, VIC-20, TI99/4 and Sinclair, in the face of heavy inventory returns, obsolescence and saturation, are cutting prices and payrolls in an effort to keep afloat...

The first American manufacturer of computers (in the 1940s), Sperry Univac, is selling a personal computer made by Mitsubishi in Japan... Another rah-rah yankee manufacturer, Monroe, procures its PC from Ricoh, another Japanese maker... The National Computer Conference (NCC), by far the largest show in the 1970s, fell far short of its attendance goals this year. 110°F temperatures in Las Vegas in July discouraged some attendees, but the rise of Comdex and various regional PC shows was probably more of a factor.

END



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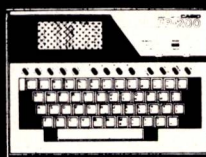


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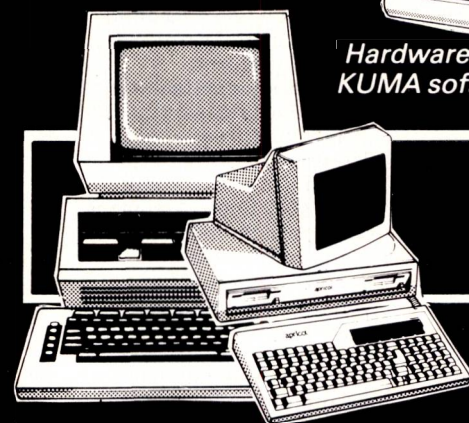
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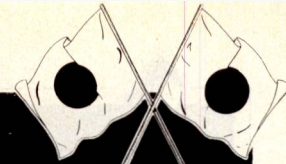
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*Shinichiro Kakizawa reports from Japan on an MSX machine with stereo sound, examinations in computer proficiency, a calculator cum credit card and software for Buddhists. Well, praise be!*

## Music while you work

A new MSX machine, Palcom, has been launched by Pioneer, a company known for its stereo equipment and more recently for optical laser disk players. The reason why Pioneer has joined the microcomputer business is clear—it wants to give added value to its laser disk business by providing a specially developed micro with convenient facilities and an interface specifically designed for laser disk players.

Palcom can control optical video disk players through a direct interface connection. As part of the deal, a number of computer games with video disks can present much more realistic pictures than any existing microcomputer graphics. The direct access capability of the video disk can provide pictures instantly, which is essential for computer games.

As Pioneer is a stereo machine supplier, it hasn't forgotten a sound system for its computer: game sounds are all generated in stereo. Mixing the sound from the video disk, stereo players, and computer-synthesised music is another standard feature of Palcom.

## Hole in your pocket?

An optical modem the size of a cigarette pack has been announced by Kanto Electronics in Tokyo. It's just 100mm x 50mm x 22mm, and can be directly attached to the interface slot without using cable or, alternatively, built into the machine.

The modem detects line defects and optical data errors; and communication distance is a maximum 100 metres using plastic fibre cable.

## Universal standard in print?

Epson is attempting to establish a standard for interfacing printers. It's proposing that ESC/P, which stands somewhat clumsily for Epson Standard Code for Printers, be adopted worldwide. The aim is to provide a common control code architecture across all microcomputers and printers, so that any printer can become connected to any microcomputer without change. At present the printer is always the major headache when buying new software, which may not be entirely compatible with your model of printer.

I understand the Epson people are busy persuading as many manufacturers as possible to agree with the new standard; and it seems that more than 20 companies have already agreed to join the bandwagon.

## More time for prayer

If you thought no more specialised software markets could be discovered, you have obviously underestimated Japanese initiative.

Denkei Computer Systems has come up with a software package to help priests and monks run their Buddhist temples more efficiently. Running a Buddhist temple is, I'm told, far from simple. It involves a lot of paperwork, direct mailing, keeping records of ancestors' posthumous sacred names, accounting, and other administrative tasks. The newly announced software addresses all these areas and creates more free time for the monks' traditional involvements: chanting, zen

meditation and preaching.

Sofar the introduction of microprocessor systems into Buddhist temples and Shinto shrines has been slow, except in large temples which can afford a sizeable computer department. Denkei thinks this is mainly due to the lack of suitably packaged software systems for the smaller temples, and hopes to change things with its new Temple Management System. According to Denkei, there are over 50,000 Buddhist temples and many more Shinto shrines in Japan awaiting suitable software systems. It believes many of them will buy its software, which costs from £950 to £1200 depending on the options the user chooses.

## Calculating credit

A credit card which can be used as a calculator has been announced by a finance company in Kyoto. Jointly developed by Casio and Dainippon Printing, the plastic credit card is laminated to the back of the Casio ultra-thin SL-800 calculator in place of the usual plastic back cover. It costs £6.50.

In Japan over 100 million credit cards are now in use and competition between the rival card companies is very tough, so in order to keep one step ahead the credit card companies are using all kinds of gimmicks to pull in the customers. The calculator cum credit card, from Shinkyoto Shinpan, is one such attempt to increase the usage of the cards.

## Shooting for the market

Another camera has succumbed to the lure of the Japanese micro market. Asahi Optical Industry, famous for its Pentax cameras, has announced its first 32-bit Pentax computer.

The Pentax runs a Unix-like UNOS operating system from Charles River Data Systems. This system is a high-end scientific and business micro, targeted mainly for CAD/CAM

applications using Asahi's proprietary program SCICARDS. It features a VERSA bus and can construct the Ethernet local area network.

## Time to be certified

One-day examinations to test the knowledge and experience of micro users were held recently in some 25 major cities in Japan. This was the second year of these nationwide examinations, and more than 10,000 micro users took part.

Japan is a highly competitive society where you can do practically nothing without a certificate; these are issued by the appropriate authority showing that you are properly qualified. Apart from the usual things like driving and flying licences, you have to pass rigorous government examinations to become a hairdresser, a cook, or even a masseuse.

And computers are no exception. The Ministry of Industry and Trade (MIT) has been conducting an information processing engineers' examination for over 15 years. Unlike cooking a fish, it's not compulsory to acquire a licence to run a computer; however, if you happen to be one of 150,000 people who have a licence your chances in the job market are greatly enhanced, your salary prospects are better, and you can charge higher fees for your freelance services.

Sofar this arrangement has only been applicable to the mini/mainframe users, and micro users were happily left alone to be content with their little machine. But now, as microcomputers spread into every home and business, the situation is changing—and you can study for a certificate to demonstrate proof of competence as a micro user.

The examination is organised by the Japan Microcomputers Club Association. It seems the papers are getting more difficult every year—last year every other participant who sat the examination failed.

Anyway, I'm not going to tell you whether or not I sat this year's examination.

**END**



*Peter Tootill has thought up a novel application for data buffers and has the latest details on computerised shopping.*

## Data buffers

As you may recall Prestel uses part of the CCITT V.23 standard and talks to you at 1200 bits/sec, but you talk back at only 75 bits/sec. If the RS232 interface on your system can't be configured to handle the different transmit and receive baud rates and you want to use it to access Prestel or PSS at the 1200/75 speed, then you have a problem. One answer is to buy an expensive modem such as the DaCom DS 2123 GT (at around £500) which buffers the data and always talks to your computer at the same speed no matter the speed at which data is coming down the line.

But an idea occurred to me while I was reading the blurb on the 'Aculab' data buffers regularly advertised in PCW. These are basically designed to work as 'printer spoolers'.

The idea is that you connect one between your printer and your computer. When you print something the buffer can receive the data as fast as your computer can send it and stores it, sending it to the printer at a speed that the latter can handle. Buffers can be as large as 256k, so you can 'print' quite a big file and then carry on with other work on the computer while the printing is still going on. Buffers are available for parallel to parallel, serial to serial and hybrid (parallel to serial and vice versa) applications.

You could use a data buffer between the RS232 interface of your computer and the modem so that if the computer couldn't handle the split baud rates, then the buffer could take the data in from your system at 1200 baud and send it to the modem at 75. It would need to do nothing to the data coming down the line except receive it at 1200 and pass it on at the same speed.

A quick call to Aculab confirmed that this would be possible, although not with a

standard unit. It did say, however, that it would be prepared to make them to order at the same price as its standard data buffers (around £200). A dual standard modem (also around £200) and a data buffer would save around £100 compared with a GT-type of modem. However, the modem would normally give you a lot more features such as auto-answer and auto-dial.

If you already have a 1200/75 modem, however, which you can't use with your computer, then a data buffer would be a cheap way of making this possible, especially if it could still be used as a printer buffer; this should be possible if you get a combined parallel/serial model.

Aculab is on (0525) 371393. DaCom is on (0908) 311885.

## Computerised shopping

More news on Commodore's Compunet which has lined up a US-style service.

Compu-Card is an American system for mail order shopping, or rather 'telephone order shopping'. The idea is that you decide what you want (by visiting your local shops) and telephone Compu-Card which will give you its price for the item in question — which it claims will normally be cheaper than your local one.

The main interest of Compu-Card to telephone networkers is that it's available online in the US to 'CompuServe' subscribers, and now Compu-Card in the UK has linked up with Commodore to make the system available to Commodore users via the Compunet system. It'll be interesting to see if Commodore can tap a new market among Commodore owners over and above those (not just Commodore users) already subscribing to Micronet — there are

certainly enough 64s and VIC 20s about.

## Bulletin Board news

Two more bulletin boards have closed down. The first is CBBS-Cumbria. The sad story behind this is that the sheer aggravation of people calling outside system hours and not using the ring-back system forced the system operator to give up. *Please, please* make sure you check the system hours of a BBS before you call it. If you aren't sure and can't find out, your best bet is to call in the evening — and be prepared for a *real* person to answer. If this happens you can (politely) ask if you have the right number and check the system hours and mode of operation. Don't call a BBS at 3am unless you are sure it runs at that time — very few people like to be woken up in the middle of the night!

The other system that has closed down is Rewtel. This was an online 'electronic catalogue' for the Ambit International electronics components company.

The good news is that there are a couple of new systems to report. The first is TBBS Nottingham. This is a multi-mode system and it will cope with V.21 and V.23 (Prestel) calls in originate or answer mode. The number is (0602) 289 783 and it runs 24 hours a day.

The second new BBS is another TBBS-based system. (TBBS looks set to take over in the UK!) It is a specialist board and its title should tell you what it's about — it's called 'Clinical Notes Online'. Run by a publishing company called ICRS-Elsevier, Clinical Notes Online is a data acquisition system for the company's database on 'Datastar' (a bibliographic database based in Switzerland, but available on the UK PSS network). Clinical Notes Online is (initially at least) available to the general as well as the specialist user.

By the time you read this, an old friend may have returned. Bettisfield Remote CP/M system is expected to be back on a new 24 hour number in the autumn. The latest news will, of course, be on Liverpool Mailbox and other BBSs. One enhancement that the system operator hopes to have is the ability to receive V.21 and Bell 103 standards at 75, 110, 134.5, 150 and 300 bits/sec in originate or answer mode! This will be useful for anyone with an old Teletype terminal as these normally run at 110, or even 75 bits/sec.

## US networks

A new type of BBS is appearing in the US; this is the 'networked' BBS. Once you have dialled one, you can transfer your call to another by a normal menu selection. One example is called the 'Mindstorm Network' and can be found on (0101) 812 235 0908. As far as I know it's a 24 hour system.

Another new Stateside system aimed at job hunters is called 'CLEO' which stands for 'Computer Listing of Employment Opportunities'. This operates in half a dozen areas in California but covers jobs all over the US & overseas. The details are as follows:

(0101) 213-618 8800 Los Angeles  
(0101) 408-294 2000 San Jose  
(0101) 415-482 1550 San Francisco  
(0101) 714-476 8800 San Diego

Or call (0101) 213-618 1525 for 'access assistance'.

## BULLETIN BOARDS

### UK free networks

**CBBS South West** . . . Tel: (0626) 890014. Hours: 24 hours daily.

**Mailbox-80, W Midlands**  
Tel: (0384) 635336\*. Hours: 6pm-8am daily (ring-back system).



## Modem Operating Frequencies

| Modem Type        | Speed<br>(Bit/s) | Duplex | Transmit<br>Frequency |         | Receive<br>Frequency |         | Answer<br>Tone<br>Freq<br>Hz |
|-------------------|------------------|--------|-----------------------|---------|----------------------|---------|------------------------------|
|                   |                  |        | 0<br>Hz               | 1<br>Hz | 0<br>Hz              | 1<br>Hz |                              |
| CCITT V.21 Orig   | ≤300             | Full   | 1180                  | 980     | 1850                 | 1650    | —                            |
| CCITT V.21 Ans    | ≤300             | Full   | 1850                  | 1650    | 1180                 | 980     | 2100                         |
| CCITT V.23 Mode 1 | 600              | Half   | 1700                  | 1300    | 1700                 | 1300    | 2100                         |
| CCITT V.23 Mode 2 | 1200             | Half   | 2100                  | 1300    | 2100                 | 1300    | 2100                         |
| CCITT V.23 Back   | 75               | —      | 450                   | 390     | 450                  | 390     | —                            |
| Bell 103 Orig     | ≤300             | Full   | 1070                  | 1270    | 2025                 | 2225    | —                            |
| Bell 103 Ans      | ≤300             | Full   | 2025                  | 2225    | 1070                 | 1270    | 2225                         |
| Bell 202*         | 1200             | Half   | 2200                  | 1200    | 2200                 | 1200    | 2025                         |

\* Bell 202 has no back channel as such, only a 5 bit/sec on/off signal (387Hz = on, no signal = off) used for handshaking. (CCITT V22 & Bell 212A do not use single frequencies like these and cannot be simply included in such a table.)

### American/Canadian networks

| TYPE     | SYSTEM NAME       | NUMBER            | NOTES                                |
|----------|-------------------|-------------------|--------------------------------------|
| Forum 80 | HQ System         | 0101.816-861 7040 |                                      |
| CBBS     | HQ System         | 0101.312-545 8086 |                                      |
| FBBS     | HQ System         | 0101.312-677 8514 |                                      |
| ABBS     | Ottawa, Ontario   | 0101.613-725 2243 |                                      |
| ABBS     | HQ system         | 0101.703-255 2192 |                                      |
| MABBS    | Fort Walton Beach | 0101.904-862 1072 |                                      |
| Bull-80  | Alabama           | 0101.205-492 0373 |                                      |
| Conn-80  | Colour Computer   | 0101.212-441 3755 | colour graphics for TRS-80<br>Colour |

### European networks

|             |                        |                                      |                          |
|-------------|------------------------|--------------------------------------|--------------------------|
| ELFA        | ABC-MONITOR<br>Sweden  | 010.468 730 0706                     | Half duplex              |
| ABC-Banken  | Halmstadt, Sweden      | 010.463 511 0771                     |                          |
| ABC-MONITOR | ABC Club of<br>Sweden  | 010.468 801 523                      | Passwords required       |
| CBBS        | Gothenburg,<br>Sweden* | 010.463 129 2160<br>010.463 169 0754 | 75/1200 baud<br>300 baud |
|             | Helsinki               | 010.358 072 2272                     |                          |

\* After receiving the tone and connecting your modem, either type <C/R> or type: <COM C/R>. The system then asks for a password which is: 'cbbs' in small letters! If you only get '>' when you dial up, the system needs resetting and you type <I> C/R.

**Forum-80 Hull** . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading. Hours: 5-11.30pm, Mon-Fri; noon-11.30pm, Sat & Sun (CCITT); midnight-8am, daily (Bell 103).

**Hamnet** . . . Tel: (0482) 497150. Hours: 6pm-8am, daily.

**Forum-80 Users Group**, PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

**Forum-80 London** . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

**MG-Net CBBS London** . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

**Liverpool Mailbox** . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

**TBBS, London** . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

**BASUG** . . . Tel: (0742) 667 983. Hours: 24 hours daily.

**Computer Answers** . . . Tel: (01) 631 3076. Hours: 24 hours daily.

**CBBS Surrey** . . . Tel: (04862) 25174. Hours: 24 hours daily.

**Blandford Board** . . . Tel: (0258) 54494. Hours: 24 hours daily.

**Southern BBS**. Tel: (0243) 511 077. Messages, down-loading. Hours: 8pm-2am daily (ring-back system).

**NBBBS-North Birmingham** . . . Tel: (0827) 288810

**TBBS Southampton** . . . Tel: (0703) 437 200 (ring-back)

**Stoke TeC (Information Technology Centre)** (Remote CP/M) . . . Tel: (0782) 265 078. Hours: 24 hours daily.

*UK commercial systems which are free in part*

**DISTEL**. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

**MAPTEL**. Tel: (0702) 552941. Run by Maplin (electronic components and micro-computers). Provides information on stock levels, credit card sales to existing

customers only. 300 baud only. Cost: free. 24 hours.  
**ESTELLE**. Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

## Subscriber commercial systems in the UK

**PRESTEL**. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: Dial 100 and ask for Freefone Prestel sales.

**MICRONET 800**. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software — for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

## Subscriber business systems in the UK

**TELECOMGOLD**. Info from: Julie Ireland, 42 Weston Street, London SE13 3QD. Tel: (01) 403 6777.

**COMET**. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.  
**\*RING-BACK SYSTEM** — dial the number, let phone ring once and then ring back.



# Most software companies assume you look like this.

There are plenty of software packages around to help control businesses. Most of them do some of the things you require very well indeed.

The trouble is, they can be rather a handful. You need one disc for word processing, another for spreadsheet.

One for database, another for graphics and so on. Each with its own set of commands.

Lotus Symphony™ does everything any office is likely to need on one disc.

It puts you in touch with others. No man is an island and Symphony's communications let you receive and send data back and forth between your mainframe and other computers.

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It gives you an enormous database with instant access to 8000 records.

And its spreadsheet is the largest and most advanced there is with 8192 rows by 256 columns.

Colour graphics are a buzz word these days, so Symphony gives you seven. All of which are available at a

single keystroke.

Symphony also caters for people who like to see everything at once.

So you can have spreadsheet, database, graphics and word processing all on screen at the same time. Each in its own window.

Then you can zoom in and out and shuffle them around like papers on a desk. Also with add-in applications, Symphony can grow with you, so there are no limits to what it can do.

Yet although it does the work of many, Symphony is easier to operate than some dedicated programmes.

But if your needs are simpler there's still Lotus 1-2-3™.

It covers the needs of most offices (spreadsheet, graphics and database) on, of course, one disc.

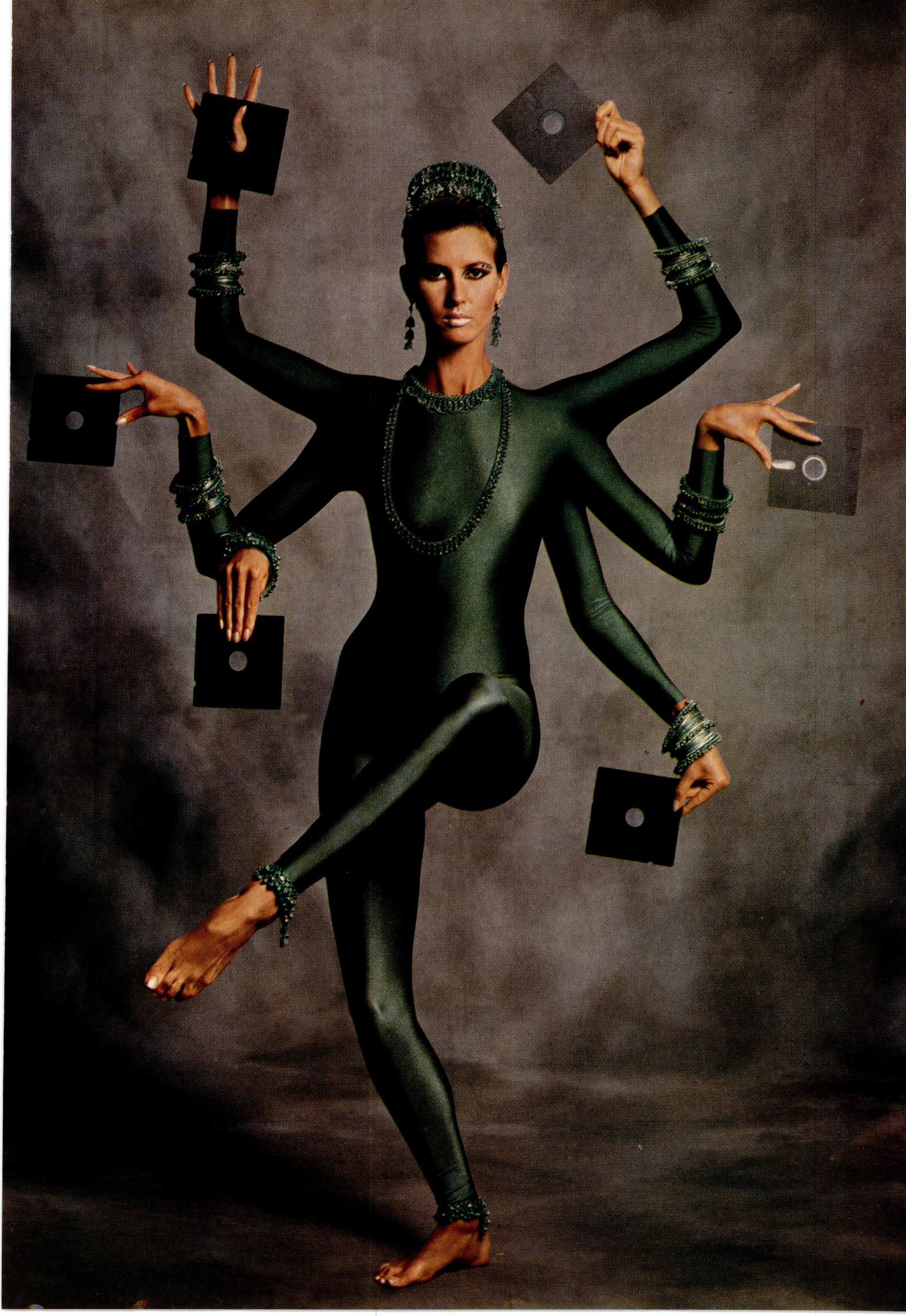
Because one thing Lotus always assumes is that you only have one pair of hands.

For further information on Symphony and Lotus 1-2-3 (still the biggest selling software package in the world) call Teledata on 01-200 0200.

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## Better late than never

We ordered a printer cable (part no ANG 04) costing £16 from Acorn Computers c/o Vector Marketing on 1 April 1982. Several letters were sent regarding the non-appearance of this item and after six months of complaining we gave it up for lost.

A couple of months later we received a letter stating that our cassette lead would be with us in the near future. *Cassette lead!* What cassette lead?

This morning, 1 August 1984, two and a half years after ordering, the cable arrived with a despatch date of 25 July 1984.

**Stuart Ward & Tommy Coombs, Dunmow Computer Centre Ltd, Essex**

## 'Informed opinion?'

I enjoyed Mike Liardet's article on writing software ('Creating a Program', PCW, June) but must object to his casual dismissal of p-code systems, whose advantages he claims 'accrues to the implementor and not to the user.' Intermediate languages offer the worst of both worlds (between interpreters and native code compilers).

Survey statistics published elsewhere showed the p-System to be number four in the operating systems hit parade (after CP/M-80, MS-DOS, PC-DOS and Apple DOS — but well in front of CP/M-86), with 12% of users. This is surprisingly popular for an operating system with no advantages to offer! It must show that a great many people feel, as I do, that the p-System has a great deal of benefits to offer implementor, user/programmer and end-user alike.

The p-System is certainly easy to implement on a target machine, although why Mike

Liardet considers this a negative point I don't know. It simply means that since it's so easy, it has more than likely been done (if not, then you can buy the 'adaptable system' version which requires only a working CP/M BIOS, and install it yourself). It also means that a range of software written for the p-System has become immediately available.

The programmer benefits greatly from the built-in portability of p-code programs. He knows that all programs previously written for the p-System (by himself or others, regardless of which machine) will run on his new system. In addition, he can take advantage of the ability to develop his software on faster machines (such as the SAGE or VAX computers) then download it to a target machine — *any* target machine. On the other hand, he can take pleasure from the fact that the p-System provides a wider market for his software than any other operating system since it includes the entire CP/M market, IBM and compatibles, Apple, DEC 68000 and Z8000. On all these systems, his software will not even need to be re-compiled.

The end-user is relieved of the burden of machine dependencies. He is able to take advantage of new developments in computer hardware without being forced to scrap his current software investment, the value of which is no longer threatened by the doubtful futures of some computer manufacturers. This advantage is provided by no other operating system. Even CP/M (which claims portability of code) restricts the user to the Z80 processor (although I am beginning to hear rumours of Z80 emulators for faster machines — that is, a p-code CP/M).

You may consider that you are simply swapping dependency on the future of your hardware for dependency on the future of the p-System. This is true to a certain extent, although I have no reason to doubt the future of the present distributors. I leave it to you to consider which situation you prefer.

A lot of rubbish is generally

touted about p-code systems, usually rotating around the word 'interpreter' (the distributors call it an 'emulator'). This brings to mind the example of a Basic interpreter (with its notorious slowness), when in fact the two are worlds apart. A Basic interpreter has to perform a multitude of tasks, but the bulk of the work involves syntax analysis of the source text whereas a p-code interpreter does relatively little work: it simply takes the p-code and executes it, and since no syntax analysis is necessary the process can be extremely fast. Obviously some degradation will occur, but this is very small compared to normal 'interpreters'. In fact, the code produced often runs faster than supposedly better 'native code' compilers. It's certainly more compact, meaning that you can write larger programs on smaller machines.

Finally, for those who feel that they *must* have native code, one of the tools provided by the p-System is a native code generator. This takes a p-code file as input, and outputs a machine code version. A nice feature of this is that you still retain the benefits of a p-code version of the software for portability, but are now allowed to convert to native code for speed once the program is transferred to the target machine.

I hope I have shown that p-code systems do have advantages to offer other than those enjoyed only by the implementor as I think that Mike Liardet's comments on this reflects simple prejudice rather than informed opinion.  
**Don Milne, Rosemount, Aberdeen**

## Advance to go?

Anthony Bretherton (Communications, September PCW) says that he believes my review of the Advance was inaccurate, yet fails to point out any examples of such inaccuracies.

I consider the keyboard to be appalling and would never consider using it for word processing (a prime use of a business system); a reviewer in another magazine felt it to be

'well-made'. Both are honest, subjective opinions.

I agree that Advance could not and does not describe the system as portable. My remark about portability was originally a joke, but was rephrased in such a way that it could be misinterpreted as a serious criticism. I do, however, stand by my description of the machine as a 'great hulking brute'. It may be little bigger than the PC at its base, but is undeniably much taller — especially if you buy the recommended monitor. Wind resistance may not be important but, to many people, a pleasing appearance is.

The bug in DOS 2.11 is one which Advance freely admits, and is the reason that the machine is currently being sold with DOS 2.13.

Finally, I accept your criticism of my comparison with the bottom-of-the-range PC: the two do not provide equal specifications. I would, however, observe that many people do not require either 256k RAM or a colour display, and I had already discussed the faster speed of the Advance.  
**Surya, Sun Technical Services, London**

## Singing the Memotech's praises

Considering the trouble Guy Kewney obviously takes to report a comprehensive and penetrating view of innovation in the microcomputer industry, it is surprising that the developments of one particular company consistently escape a mention in Newsprint.

The Memotech machine is one of only a handful of home computers which offer true upgradability to a business system, and is competitively priced at both ends of the market.

What sets it aside from the competition, however, is the successful application of state-of-the-art thinking to every aspect of the product range. While Acorn (with its Z80 add-on processor), Advance and Computers triumph in the ability to 'stuff' existing hardware and design



into distinctive looking plastic boxes, Memotech has developed fast-access silicon disks, ROM-based CP/M software, and the expansion option of a high resolution graphics processor, which is capable of reproducing more information on a screen than can be generated from a colour TV camera.

As a matter of passing interest, this is all encased in an aluminium shell which probably represents the only innovation in the physical housing of microcomputers since they first appeared: it simultaneously protects circuitry from radio interference, overheating, and physical damage.

On a personal note, the flexibility of the MTX series will actually enable me to afford a WordStar-derived word processing system for project work and job applications in my final undergraduate year, because the ROM-based version of WordStar does not require disk drives.

**John Proudlove, Leicester**

*(Your wish is our command—see the Memotech Benchtest on page 168—Ed.)*

## Are we speaking the same language?

In reply to Anthony Hegedus' & Daniel Sutton's Basic-bashing letter in the July issue of *PCW*, what could replace Basic?

Forth and Pascal are suggested, but Forth is, in my opinion, little more than a medium-level assembler. It, not Basic, is the 'most complicated and unreadable' language around—remember that it was designed for engineers and astronomers to control radio-telescopes and other mechanical equipment, not for home micro users.

Pascal is a much better choice, but is usually disk-based and compiles the source code. I don't think it is really suitable for beginners who wish to experiment, writing very small programs, quickly and making many changes and corrections. Pascal was, after all, written for university students and professional programmers who wished to write large programs (often 10,000 lines of code or more). The great advantage of Basic is that you can edit your program from Basic, and then immediately run your program, re-editing it whenever you find any errors (or rather, when the computer finds them!).

My own suggestion for an

easy replacement of Basic is a little-known Danish educational language called Comal. It was developed very recently—in 1980, as opposed to the sixties (Pascal) or the early seventies (Forth). Comal is really an interactive cross between Basic and Pascal.

At first glance, Comal is little more than a set of structured extensions to Basic. However, the difference in clarity between a nicely written Comal program and any Basic program is amazing. Comal adds spaces between keywords—even if you had omitted them, and indents all loops (correctly unlike BBC Basic with LISTO 7 selected). It is structured, having such useful commands as: repeat-until, while-endwhile, if-then-else-end if and case-when...-endcase; and allows procedures and functions. It is a thousand times easier to use than Microsoft, GW or BBC Basic! It, unlike Forth or (to a lesser extent) Pascal, is designed specifically for educational use in schools and in the home—not for controlling radio-telescopes!

My final point is that we may, of course, leapfrog all such 'procedural' (do this, then do that) languages, and replace Basic with a 'functional' language, such as Prolog or Hope, in which we tell the computer all the rules that can be used, but not the order in which to apply them.

The job of the language is to work out the solution by applying the rules in whichever order it 'thinks' best. These languages are undoubtedly the next major step forward in computing, but it may be some time before home micro users get any of the benefits.

Already, however, some micros, notably the Spectrum, have versions of Micro-Prolog appearing on them. And what about Logo, Lisp, and others, several of which are appearing, strictly as second languages, on various micros.  
**Duncan White, Amersham, Bucks**

## Writing a blank cheque

Many micro magazines have remarked on the high price of Sinclair microdrive cartridges. One of the proposals, however, to offset the loss of revenue throughout the software industry caused by illicit copying, is to impose a surcharge on blank cassettes. Effectively this is what Sinclair has done—though it would seem that the company should

provide software houses with cartridges at reduced prices so that software on cartridge is marginally more expensive than a blank. This would reduce the benefits of copying (even though microdrives are multi-file media) and pass the profits to Sinclair and its associates.

Perhaps this explains why there is no cassette interface?  
**D Mitchell, London N16**

## It's not what you put in...

I think Brett McBain, in the August issue, is wrong in assessing the value of something from the work put into it. A better way might be to estimate the entertainment time derived from the object. A good book then may give 10 hours of entertainment, whereas a good program may give an order of magnitude more.

In an attempt to raise the silly argument, which is so much a part of the micro scene, to the level of an art form, may I further suggest that while a human being may be conceived in a very short time indeed and with little effort, few people would choose these criteria to estimate the individual's eventual value to the rest of us!

**Jonathan Moore, Cheltenham, Glos**

## The use of HOLD isn't bold

Guy Kewney's Benchtest of the Tatung Einstein in the August issue was admirable—thorough, and well balanced—but his comment that using HOLD 'can also be a nightmare' is no more relevant to its worth,

than it would be to say that a Rolls-Royce can be a nightmare if you carelessly drive it through a built-up area at over 100mph!

The HOLD command is also available in Xtal 3 Basic, and is one of the most useful tools available to a programmer. Here is an example of its use: let's suppose we have a program covering lines 0-9000, together with a second program occupying the same lines. Suppose that we want to take a subroutine occupying lines 8000-8500 from the second program, and compact it so that we can slip it into a space between lines 300-400 in the first program. It could be done like this:

- (1) Load the first program
- (2) ENTER <HOLD 1,9000>
- (3) Load the second program
- (4) ENTER <DEL 0,7999>
- (5) ENTER <DEL 8501,9000>
- (6) ENTER <RENUM 300,2>
- (7) ENTER <LIST>. This allows

you to check that the renumbered Lines lie between 300 and 400, but if not to renumber them again.

- (8) ENTER <MGE>

The deed is complete; and I do not think any other interpreter would make it quite so simple.

Note too that if a part of a program is renumbered, then all the GOTOS are correctly renumbered including the lines which have temporarily 'disappeared', because they are being HELD.

Let's hope that all future interpreters have this facility.

**Andrew R B Ferguson, Henley-on-Thames, Oxon**

## Ode to a QL

In your August issue, Leslie Phoenix gave a somewhat one-sided explanation of the meaning of the term 'quantum





# XCHANGE

## There's never been a business software system like it before.

If you're in the market for business software, we think you ought to read our brochure about Xchange before you reach a decision.

Why? Because, quite simply, there has never been a software system like Xchange before: a modular integrated suite of business applications programs for desk top micros.

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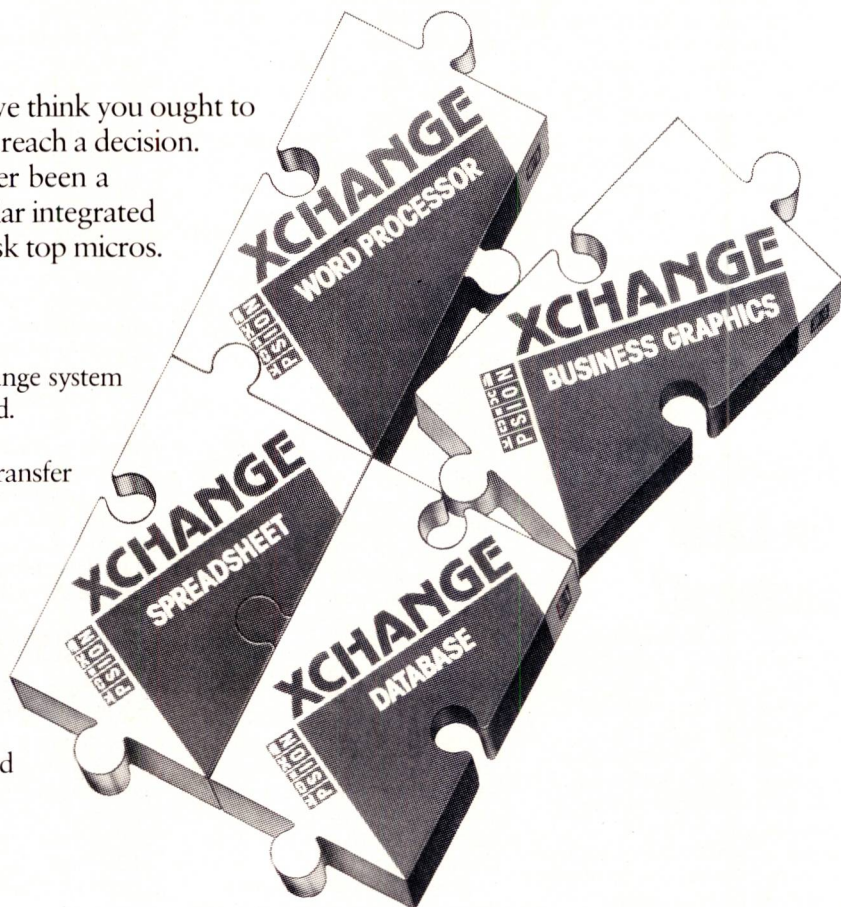
Xchange enables you to switch between as many as eight completely different tasks and transfer information freely between them.

For the first time, you can have a micro that really works the way you do – moving from job to job and working with different people throughout the day. With Xchange, it's like having eight micros on your desk at the same time.

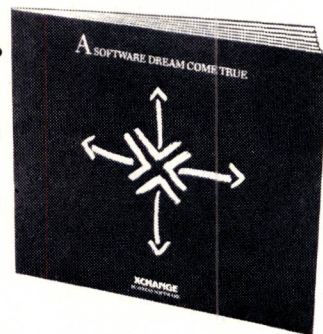
Xchange is available now for the IBM PC, IBM XT, Apricot, Apricot Xi and Sirius 1. The complete suite costs £495, individually the Word Processor, Spreadsheet and Business Graphics programs £175 each, the Database £250 (all excluding VAT). Versions for the Apple Macintosh, and other leading makes of 16-bit micro will be released later in the year.

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PCW1

PSION



leap'. I have never seen a concrete scientific definition of it in any reference book and when it first came to my attention (about 15 years ago) it was always being used during lectures to mean something insignificant (that is, the smallest leap possible).

Later, to my astonishment, it started appearing in the popular press in the sense of a leap of staggering proportions. In fact, I complained to a *Sunday Times* journalist about this.

In the absence of concrete proof to the contrary I choose to believe that this is yet another media 'hype' and intend to poll the readership of some suitable scientific journal in order to settle the question for good. I certainly do not agree with your correspondent's interpretation, which is more poetic than scientific. After all, whether measured in nanometres or electron volts they are still very small leaps. Their discontinuity is hardly surprising — that is what quantisation is all about!

Incidentally, on the subject of poetic quanta, your readers may like to know that the immortal 'Rabbi' knew something about waiting for Uncle Clive's products, 'I waive the quantum o' thesin,

The hazard of concealing;  
But oh! it hardens a' within,  
And petrifies the feeling!  
(R Burns. *Epistle to a Young Friend*)

He was obviously a keen hacker, as shown by his:  
'What's done we partly may compute,  
But know not what's resisted.'  
(R Burns. *Address to the Unco Guid*)

And did he not say something about 'mice ganging aft a-gley?'  
**Dr David J Fisher, Cardiff**

## Room in the next carriage

With reference to Paul Overaa's series, 'Teach Yourself Assembler', part 7 (August), forgive me if I'm wrong — not being *au fait* with Z80 machine code — but it strikes me that his 'final version' of the Z80 buffering routine, (Fig 6), will not work as the buffer gets full.

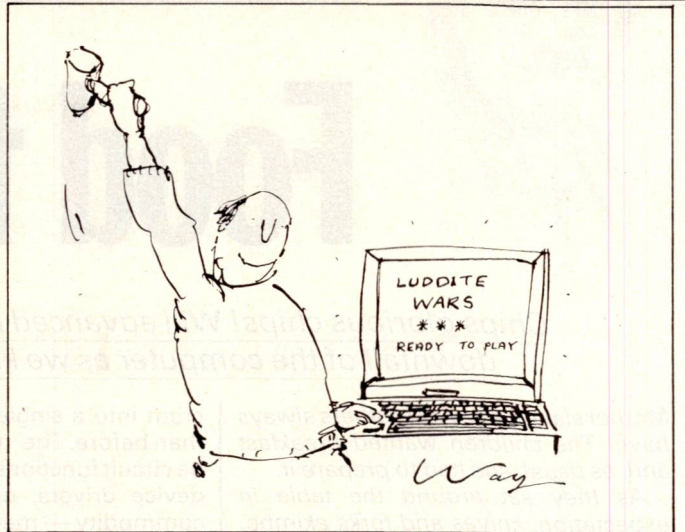
The test for buffer full is that the counter is incremented from 255 to 0, whereupon the, now zero, counter is stored, so the buffered 255 characters are lost.

Not only this, but the last character read is thrown away.

If this is what is meant by "... any over-sized entry will be safely ignored," I am not impressed.

**RP Flood, Liverpool**

*(The point you have missed is that the routine is designed to handle input items of up to and including 255 characters only (plus a terminating carriage return!). At the 'buffer full' point, where 255 characters have been entered, the typing of a carriage return will result in the correct storing of the count (255) at the head of the buffer. If you reach the buffer full condition and the next character entered is not a carriage return then you are trying to deal with a string of at least 256 characters. At the top of page 164 we do point out that oversized entries such as this will be 'safely ignored'. If you attempt to enter a 256th character that is not a carriage return the routine will treat that entry as invalid and, as you rightly state, the 255 characters collected before the routine recognised that the entry was*



*invalid, are ignored.*

*To appreciate why we used this approach you need to understand the operation of the 6502 version. This uses indexed absolute addressing to place the character in the buffer. If we did not screen out 'partial entries' — that is, simply took the first 255 characters or anything typed, then the 6502 version would 'wrap round' the buffer area and on the 256th, 512th character... would, firstly, place the latest character into buffer byte 0 (creating a false count in the count area) and, secondly, overwrite existing data in the buffer. This would result in meaningless partial entries being created in the 6502 version — Ed.)*

## Case of the missing 'brain

I bought my NewBrain AD (612-160) from Grundy Business Systems (GBS) in November 1982. In July 1983, the machine was returned for repair because of a problem with the video output signals. However, in September 1983 I was notified that GBS had gone into liquidation, and that my unrepaid NewBrain had been put into safe-keeping.

I subsequently wrote to the liquidator enquiring about the condition of my machine. The reply was that the matter had been forwarded to Tradecom International BV.

After waiting for some time, I became impatient and wrote a letter to Tradecom in December 1983; but I did not get a single word of reply.

Recently, I ordered another NewBrain AD from Kuma Computers Limited. Nevertheless, I won't give up on my original NewBrain, though I am now more

interested in getting the money back rather than the machine as I have another one.

What should I do?

**Leonard Chan, Kennedy Town, Hong Kong**

*(Tim Harris at the liquidators, Deloitte Haskins & Sells (DHS), assures us that machines such as yours are in store in the UK, and will be returned at the owner's expense, on application to DHS at 128 Queen Victoria Street, London, EC4. — Ed.)*

## Micros and music

The Capital Region Information Centre (CRIC), part of the Micro-electronics Education Program (MEP), is producing a booklet for music teachers and students entitled *Microcomputers & Music Education*. Following an introduction to the subject, the booklet will contain a list of useful software/hardware currently available.

Could any readers with relevant information contact me as soon as possible:  
**Nick Pickett, Music Dept, Middlesex Polytechnic, Trent Park, Cockfosters, Hertfordshire**

## Bad practice

While I am not a NewBrain owner I suspect that the DEF FN() problem described by AV Thomas (TJ's Workshop, PCW, June) could be due to the function definition being set up on entry rather than at run time; and plainly the search of the definitions table ends at the first occurrence of the name being searched for.

Whatever the reason, I would regard multiple definitions of the same function as bad practice. Most languages prohibit it.

**PR Chantler, Barnhurst, Kent**

## BLUDNERS

Things got a little confusing in Guy Kewney's September news story on Torch (page 91), announcing that the C68000 micros had been officially approved for connection to BT lines.

The picture which ran with the story was of an early version of the Graduate, Torch's IBM PC compatible upgrade for the BBC B.

In fact the on sale version looks a little different. All this, of course, entirely separate from Torch's Unicorn upgrades to the BBC B which, at the top of the range, offer the

68000 processor and Unix System III.

**PCW Show.** With much embarrassment we admit to getting the dates of our own show wrong in the Show Preview (September 84). The dates are 20-23 September, with Trade/Press day on the 19th.

**Program File:** 'Butterfingers' (August PCW) for the UK101 was attributed to only one of its two authors.

Our apologies to Martin Beeby for missing his name off the credits.





## BANKS' STATEMENT

# Food for thought

*Chips glorious chips! Will advanced molecular engineering bring about the downfall of the computer as we know it? Martin Banks chews it over.*

*Mother slaved away as mothers always have. The children wanted breakfast and, as usual, she had to prepare it.*

*As they sat around the table in expectation, knives and forks akimbo, she placed before them the products of her endeavours. 'Now remember to eat your chips, dear,' she told the youngest. 'You'll never be brainy if you don't eat your chips.'*

*'Aw, but Mum,' whinged the small person, 'they taste awful. They don't taste a bit like the ones Grandma makes.'*

*'Yes dear,' Mother replied, 'but hers are made in the old-fashioned way — from potatoes. These new ones are much better for you. They're full of fibre and trace elements — and they're good for the brain.'*

*'Good for the brain?' the small person enquired.*

*'Yes, eat enough of them and they might grow into one inside you.'*

Yes, well. Ever since the national newspapers first discovered the microprocessor *et al* and found that they were generically referred to as chips, stories of the chip kind have been found everywhere. In time, all that clever stuff passed on, never, one hoped, to be seen again. But current research and development efforts are leading us inexorably towards the bio-chip and more 'chip'-based stories.

More properly called molecular electronics, bio-chips are expected to be around in workable form within the next 20 years. This may seem like a long time, and it is when one considers just how far the microcomputer business has come in under 10 years from the appearance of the early Altairs and Imsais. But it's no time at all in the great scheme of things, and when one considers what might be possible with bio-chips, the progress made so far in electronics starts to look like the early struggles of the Wright Brothers.

It is first necessary to consider what molecular electronics is all about before thinking about its implications. In essence, what is happening is the development of a technology that can create circuit elements which are some 50 nanometers long: (the size of an individual molecule). In the world of microelectronics, it means the ability to

cram into a single device much more than before. The 'more' in question can be circuit functions like I/O systems and device drivers, or that all-important commodity — memory. Storage capacities thousands of times greater than anything currently envisaged could be possible, while the complexity of functions available in a single chip is nothing short of mind-boggling.

All this is well beyond the capabilities of any semiconductor technology currently used to process silicon-based integrated circuits. Indeed there are still two schools of thought on which is the best way to achieve such results — the biological route or the biochemical route. You will note that the same prefix appears in both cases — bio. Organic materials such as proteins are to be the building blocks from which these devices will be manufactured. It's quite possible that genetic engineering will be used to create microbes which will actually synthesise circuit elements, or even complete circuits.

Not surprisingly, there are many technical problems to be solved before molecular electronics appears as a working entity. Not least among these problems, according to one forecast report from Technical Insights in the USA, is just how connections between the molecules will be achieved. They will have to be brought together in some form of matrix if there's to be a working circuit, but achieving it with such small elements is going to require something completely different from good ol' copper wire.

Despite such apparently fundamental problems, the Technical Insights forecast is predicting that the first demonstration chip components, items such as simple switches and memory elements, could well be in existence within five years.

This is not very long to wait and see if the new technology does emerge. And if it does then be ready, for it's likely to bring with it not only major opportunities for new applications of electronics and computer technologies; it could also wreak havoc with existing applications and design approaches. The computer, as we currently conceive of the beast, may be doomed.

As an example of what might be

possible, take that most typical of applications — the small business management system. Take also the area of portable computing, the convenience of which interests all of us. Many people and companies have, from Adam Osborne onwards, tried to combine these two into a single entity with varying degrees of success.

The Osborne had the essential applications but was somewhat hernia-inducing when it came to portability. The smaller the machine, however, the less it meets the applications criteria, until one ends up with pocket 'computers' that are essentially calculators with ideas above their station.

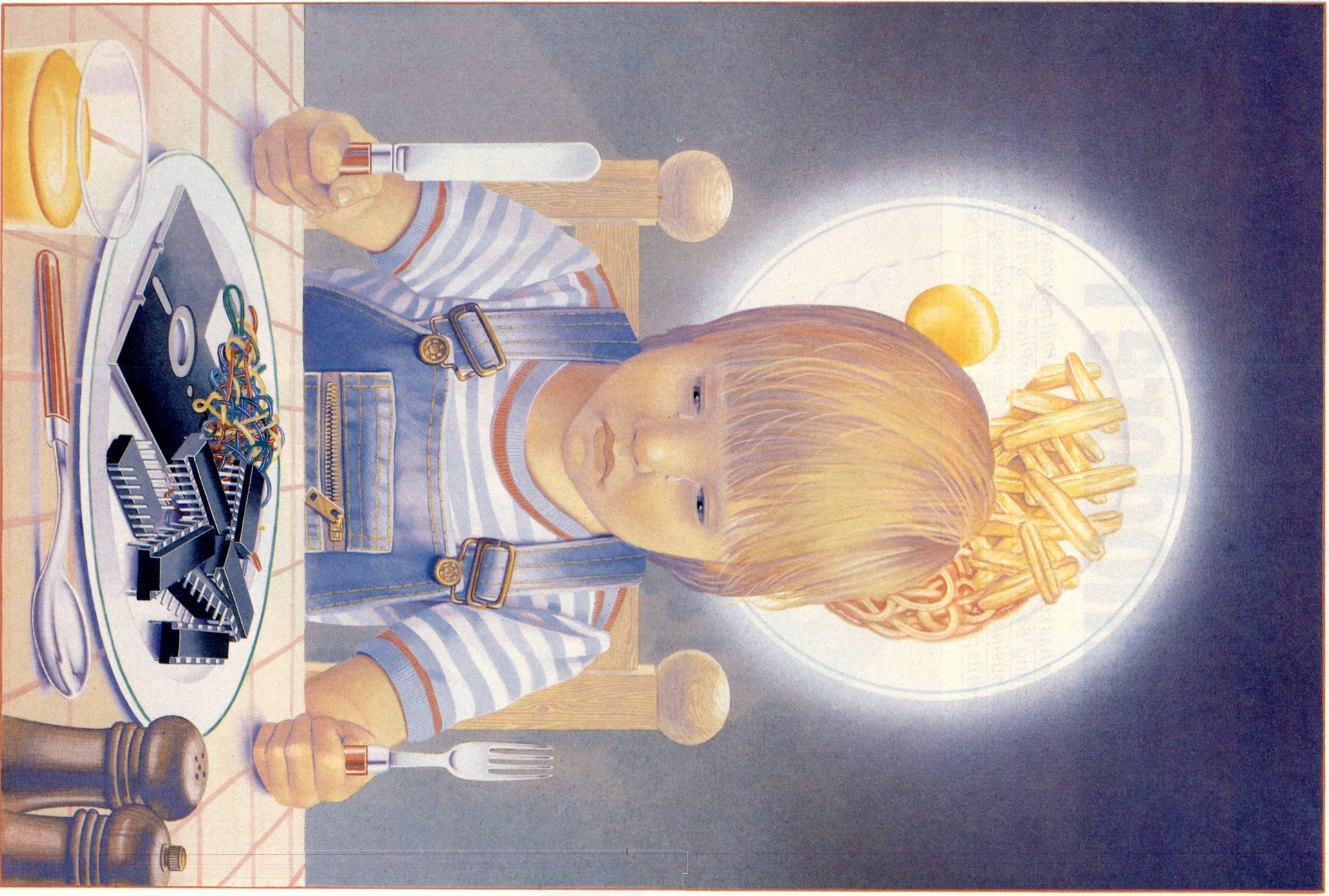
Molecular electronics holds out the promise of Gigabyte-sized memories driven by 64-bit processors, all in a pocket calculator package. And a keyboard? Well, with processing power like that available, throw in speech recognition and synthesis for nothing: the pocket-sized business computer becomes quite feasible. The amount of processing power that could be squeezed into a small space would make it feasible to spread computing power around. There would be more than sufficient power to handle all the communications problems, and overcome the majority of protocol and operating system mismatches that are the great hindrance to intercommunications today. Instead of working on producing new standards that everyone should adhere to, we could work on producing systems which didn't really care too much what 'standard' was used. It could run everything from Kansas City audio tape, through CP/M and MS-DOS, then go on past Unix towards whatever comes in the future.

And with that level of power coupled with complex communications (all in a tiny little package, remember), why not have systems implanted in us? The sci-fi ideas of implanted computers to allow the blind to 'see', or to control artificial limbs, could all be possible applications.

And the opening scenario? Even that could happen. We could start eating our way to a better memory and see IBM buy Kellogs as its new distribution company.

END



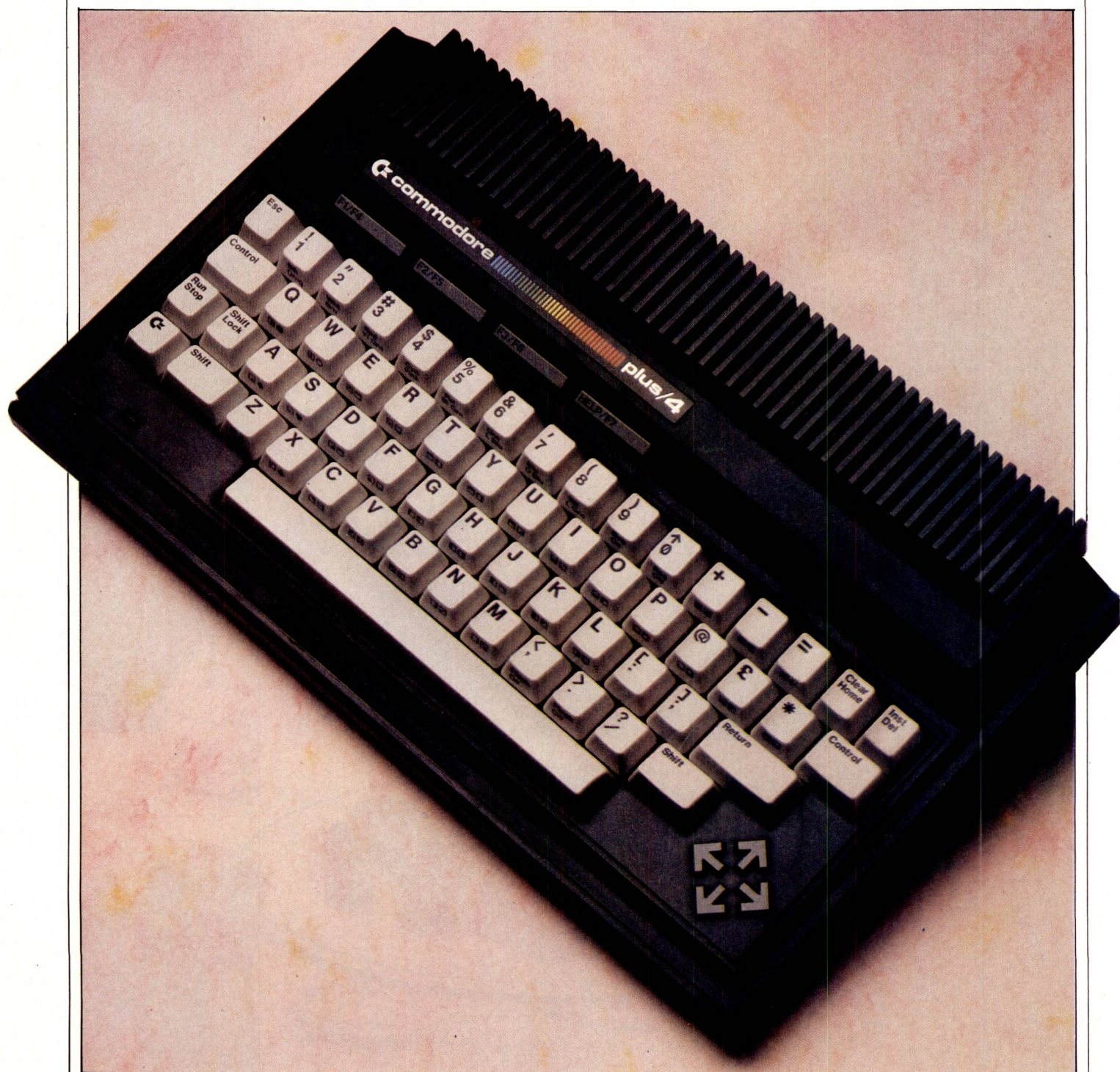






# Commodore Plus/4

*Commodore has kept the world waiting for its first new machine since the best-selling '64, and has now produced the Plus/4—an inexpensive home/small business micro with four built-in software packages. How does it compare with its projected nearest rival, the QL? Tony Hetherington finds out.*





Commodore shares the number one-selling micro slot with Sinclair through its Commodore 64, so the computer world has waited with bated breath for the new Commodore micro, the Plus/4.

For under £250 it offers the potential buyer a home micro with four built-in business packages, a word processor, spreadsheet, file manager and graphics package.

It has, however, abandoned the sprites and sound of previous Commodore machines in favour of a new Basic and a built-in machine code monitor called Tedmon.

## Hardware

The Plus/4 is extremely small. It's not down to the size of the Spectrums of this world, but it must be the smallest machine yet to house a full qwerty typewriter-style keyboard, and function and cursor keys.

This 'micro' computer is housed in a charcoal grey plastic case and is accompanied by a power supply, TV lead and manuals: The power supply is standard Commodore which looks ridiculous alongside the Plus/4, and should be hidden at all times.

The qwerty keys are moulded from off-white plastic, and are nicely shaped but have rather a light touch; nevertheless, I didn't have any overtyping problems. The letter and number keys also have two graphics, or functions, attached to them, and are accessed by pressing the required key along with either the SHIFT or COMMODORE keys. Arranged along the top of the qwerty keys are four grey function keys, which with the shift key give seven programmable functions and a HELP key.

There is an MSX-style cursor key cluster on the bottom right of the keyboard, with the cursor keys shaped into arrows.

The keyboard unit is physically similar in shape to the Oric Atmos, as it has a flat plate containing the keys mounted on an angled plinth. This plinth slopes the keyboard at a pleasant angle, and also contains a range of ports and interfaces.

The right-hand side of the machine houses the ON/OFF and RESET keys, and the left side a TV output. From left to right along the back are the power input, serial port, cassette port, I/O port, a cartridge slot labelled 'memory expansion', two joystick ports and a video output.

The two joystick ports are Commodore's own design, and replace the standard ports found on the VIC-20 and '64 to allow you 'to use Commodore's advanced joysticks'. I tried these 'advanced joysticks', but couldn't find anything about them that was so spectacular to warrant a move away from standard ports.

Another Plus/4 move away from standards is the cassette port which allows you to use the new Commodore 1531 Datasette, but I've yet to discover any significant differences between

this and its VIC and '64 predecessor, the 1530.

Fans of the infamous 1541 disk drive will be delighted to hear that you can still use this with the Plus/4 via the serial port (note that this is soon to be replaced by the 1542 drive, which is really a bug free 1541 in a different-coloured box). You'll also be able to buy a super new fast disk drive, the SFD-481, which is reportedly 12 times as fast as the 1541 and will plug into the cartridge slot.

The curious I/O port will apparently take an RS232 adaptor plug, and a modem that allows Commodore owners access to a wider range of peripherals and accessories.

The review machine was described as a 'final preproduction model', and its insides revealed exactly what that meant. The hardware was the final configuration, but was achieved by the use of numerous EPROMs and a spaghetti of patching wires. The hardware will stay the same but the circuit board will be tidied up on production

versions.

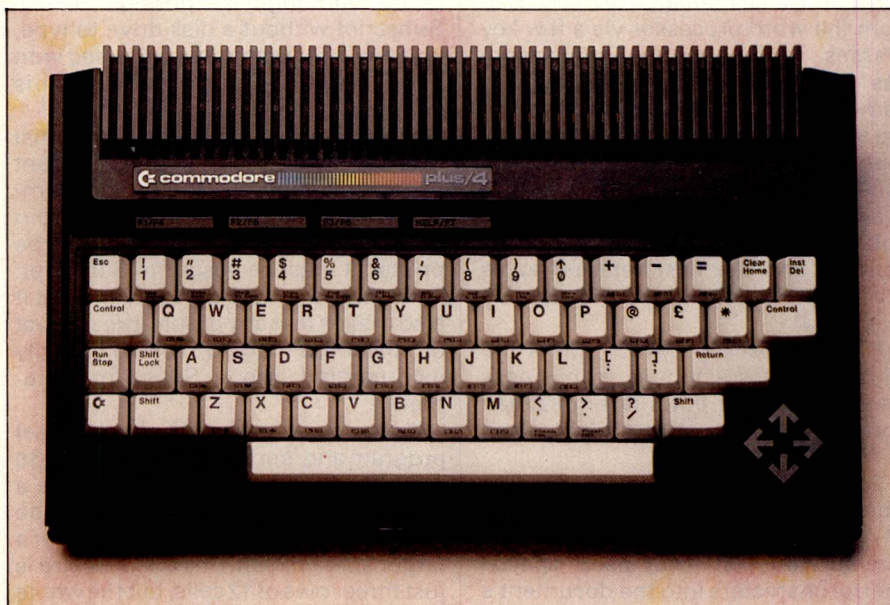
The Plus/4 is driven by a 7501 processor (another 6502 derivative) which runs at between 0.89 and 1.76MHz. This is dependent on the amount of text and graphics on the screen, which is reminiscent of ZX81 days with its fast and slow modes.

Alongside the CPU is 64k of RAM and a bank of four ROM chips, which include 32k ROM incorporating the Basic and 20k of 3-Plus-1 software.

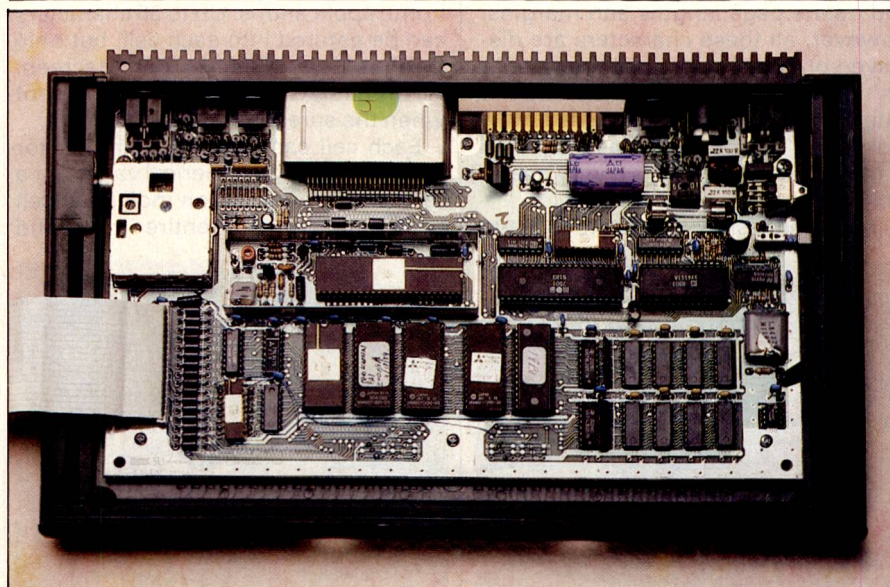
## System software

When the Plus/4 is switched on the opening screen is displayed, informing you that the Plus/4 runs under Basic 3.5 and has 60671 bytes free. Below this is an invitation to press F1 and enter the delights of the built-in 3-Plus-1 software. 3-Plus-1 is to be a major selling point of the Plus/4, and in Commodore's eyes sets up the machine as a QL competitor.

Consequently the success of the Plus/4 will depend largely on the relative strengths of 3-Plus-1 over its QL

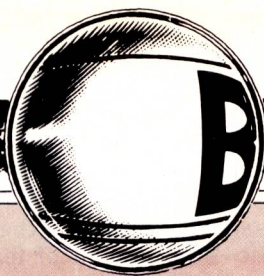


*The keyboard features a full qwerty layout and an MSX-style cursor cluster*

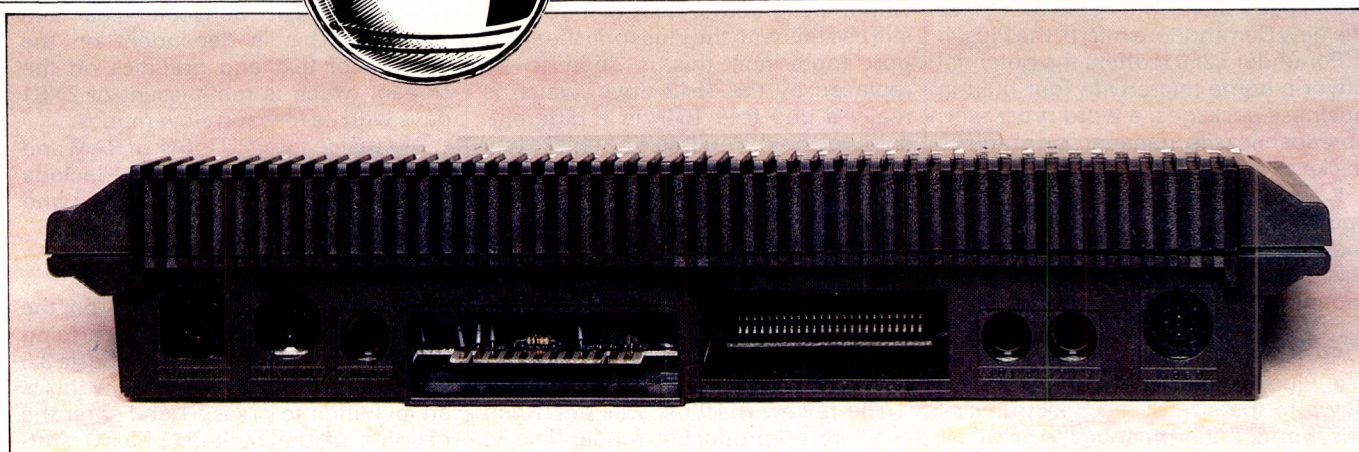


*The 3-plus-1 software is housed in two ROM chips alongside the Basic ROM chips*





## BENCHTEST



From left to right: power, serial output, cassette port, I/O port, cartridge slot, and two non-standard joystick ports

counterparts.

Pressing F1 from the power-up screen takes you directly into the first of the three main packages, the word processor. The other two, a spreadsheet and a file manager, are accessed from the word processor via a few key presses. Unfortunately Commodore has failed to give these packages a name, so I'll have to christen them for the sake of individuality.

In essence the word processor is a subset of the Easy Script program available for the '64, so I'll call it Subscript. The others are not so easily defined, and are best referred to as 4calc (spreadsheet) and 4base (file manager).

The final package which forms the 'Plus-1' is described as a business graphics package, but is little more than a graphing utility used solely by 4calc so I'll treat it as such.

Subscript is a competent product which allows you to type and edit 80-column documents on a 40-column screen. You can also insert special control characters into the document's text which are used to centre or justify text, create page headers and footers, and define page lengths and margins. However, all these characters are displayed on the screen at all times, so it isn't until you actually print out the letter or document that you see how it looks. This is unfortunate as a preview of the finished product is a very useful facility.

On the plus side you can load, save

and merge documents from a disk drive, and integrate Subscript with the other packages to produce, for example, a letter individually addressed to everyone on your mailing list held on 4base. Although it's possible to use Subscript without a disk drive to type, edit and print letters, it's best used with one. The same is true of 4calc, but one is essential if you are to use 4base.

Subscript has one final but essential task to perform, and that is to be a front end for the other packages. For example, you enter the other packages from Subscript and before anything can be printed it must be passed to Subscript. This may have its disadvantages, but it also means that any graph spreadsheet or database record can be easily incorporated into a Subscript document.

4calc is a powerful spreadsheet program and is entered by keying 'tc' (to calculator) while in Subscript. It has a standard spreadsheet format with the screen as a window that's moved over a larger spreadsheet. The window size is just three rows of 12 cells, but the whole sheet is 50 rows by 17 columns making a total of 850 cells — sufficient for most home applications. Up to 36 characters can be entered into each cell, but only the first 11 are displayed on the screen. All the characters are of course present when the spreadsheet is printed out.

Each cell can be filled with text for either a heading, numerical values, or a formula that can act on individual cell contents and sum entire rows and

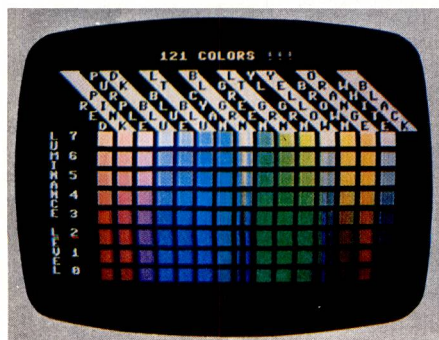
columns.

4calc includes a powerful spreadsheet editor which not only allows you to change the contents of any cell, but also lets you insert or delete cells in the middle of rows and columns. You can even copy whole rows or columns and edit them, thus greatly speeding up input of a lot of similar data.

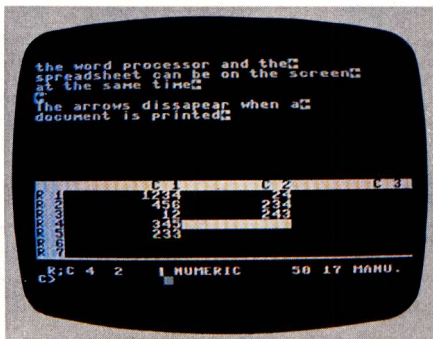
Press 'gr' when in command mode and your spreadsheet will be automatically graphed by the so-called business graphics package. Although this is quite useful there's only one type of graph available, and that's a very rough bar chart. It's rough in the sense that it's unfinished, for it has neither a scale or axis labels. The bars themselves are constructed solely from hash signs.

However, all is not lost. Since 4calc is fully integrated with Subscript, it's easy to pass the graph or indeed all or part of the spreadsheet to Subscript. It then becomes part of a Subscript document and can be edited. Particularly useful in this respect is Subscript's search and replace utility, which can be used to replace the hash signs with a more appropriate character to give the bar chart a more pleasing appearance. Transferring data from 4calc to Subscript is made even easier by the ability to split the screen and have it displayed in either half: you can pass a completed spreadsheet to Subscript knowing exactly where it will appear in your document.

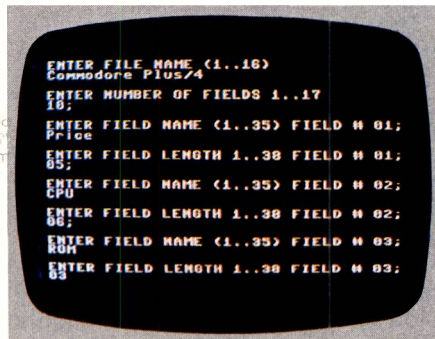
As with Subscript, 4calc supports a disk drive so that you can load and



The Plus/4 features 121 colours



Subscript and 4calc displayed together



4base files are easy to create



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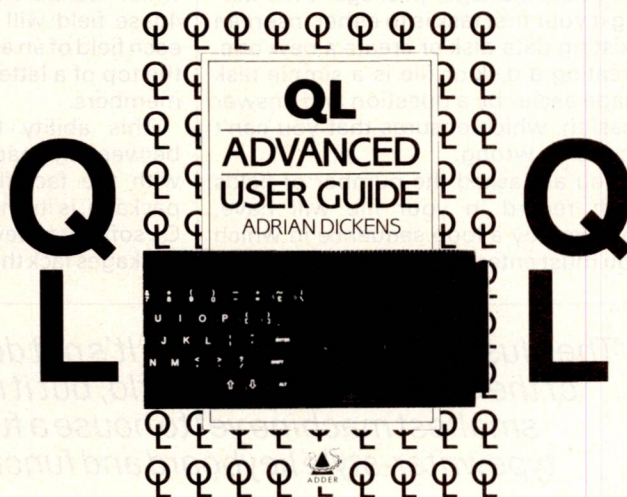
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save completed spreadsheets. A disk drive is, of course, essential to 4base as it's a disk file manager package. On entering it your first task is to either insert an existing data disk or create a new one. Creating a disk or file is a simple task made easier by a question and answer session, which ensures that you can't go too far wrong.

You are asked the number of fields each record in your file will have, followed by a loop sequence in which you must enter each field name and the

the 4base disk; all the necessary commands are part of Subscript. These are additional control characters which define where in a document a 4base field will appear: for example, each field of an address file is defined at the top of a letter to be sent to a club's members.

This ability to rapidly pass data between the parts of 3-Plus-1, coupled with the fact that it's a ROM-based package, is its main advantage over the QL software. Nevertheless, the 3-Plus-1 packages lack the innovation and some

pixels is restricted to one foreground and one background colour in each  $8 \times 8$  pixels square. More colours can be included in multicolour mode, which falls half way between high-res and the 24-line 40-character text mode. This has a lower resolution of  $160 \times 200$ , but each character can have more than one colour.

There are two more graphic modes: the high-res and multicolour modes, with the bottom five lines reserved as a text window.

Seasoned Commodore programmers will be surprised with the ease in which high resolution graphics can be created on the screen. Lines can be drawn with the DRAW command as well as BOXes and CIRCLEs; boxes can be filled in and even rotated through any angle. A powerful PAINT command ensures that irregular shapes can be quickly coloured: in other words, the days of having to POKE anything you want on the screen are gone (such a facility still exists but I can't see anyone using it). Unfortunately the sprites, which were the stalwarts of '64 games, have also disappeared along with two sound channels. In their place the Plus/4 has advanced graphics commands, and also the ability to format printed output with the PRINT USING command which can, for example, ensure that a £ sign is in the right place.

As a bonus to machine code programmers there's a built-in machine code monitor called Tedmon. Through a series of ten commands this allows the machine code buff to examine and manipulate blocks of memory, and even assemble or disassemble single lines of 6502 machine code.

It's not really surprising that Basic 3.5 contains a full list of disk commands, since its built-in software is so heavily dependent on a drive being present. HEADER is such a command, and is used to format a disk before it's used by the Plus/4. There are two forms to this command: one which formats the entire disk before writing a directory, another which overwrites an existing directory. The full header takes about one-and-a-half minutes to format a disk, whereas the quick HEADER can overwrite a directory in just three seconds. Obviously the full header

*'The Plus/4 is extremely small. It's not down to the size of the Spectrums of this world, but it must be the smallest machine yet to house a full qwerty typewriter-style keyboard and function keys.'*

number of characters allowed for the contents. When this sequence is complete, 4base displays all the field names and field lengths along with a calculated maximum number of records allowed. This is limited by the capacity of a disk and has a maximum of 999 records, obviously affected by the length of and number of fields as well as the field names. The minimum number of records is 200, which consists of 17 fields of 38 characters, each with a 35-character field name. Consequently you may have to be prepared to reorganise your file to get the required number of records.

When you have defined your file, 4base formats a disk for you. This is dependent on the number of records and can take between 130 and 160 seconds, and is longer than the standard disk formatting because it writes record details onto the disk. Once this is completed, 4base will report the space left on a disk.

It may seem a little curious to have on average 140 free blocks, particularly if you have had to reduce field lengths to accommodate your records, but this space is used by 4base to store sort files created by its powerful sort routines. You shouldn't use a 4base disk for spreadsheets or documents as they will take up this space.

When the file is defined you can easily enter record details. You can also search for specific records or have 4base run through them in sequence—in fact, all you would expect from a database including sort routines. You can sort the whole file by any field or fields and even sort a set number of records (for example, the first 50), or define a range in which only sorted records will fall.

As with 4calc, data from your files can be printed by Subscript. The data is passed to Subscript but is drawn from

of the better features of their QL counterparts.

Plus/4 programmers will use an odd mixture of the old and new when they program in Basic 3.5, since according to Commodore it contains Basic 2 and Basic 4 commands seen on previous Commodore machines, mixed with powerful graphics commands.

Programmers will also appreciate the full screen editor accompanied by an overworked ESCAPE key. Pressing this key together with others produces powerful editing features, such as delete to start or end of a line. In addition, you can also scroll lines, insert characters and even define a screen window.

Another overworked key is the HELP key which aids in program debugging. Imagine that you have written a program with several multi-statement lines and one of them contains an error. At first sight, the Plus/4 is particularly unhelpful as all it displays is 'Syntax error' followed by the line number; pressing HELP will display the whole program line and flash part of it, starting with the statement containing the error. This is quite an unusual interpretation of a HELP key, and there are further surprises contained in the Basic—commands that are found on other machines but have an unusual format or syntax. For example, Auto 10 will, as on other machines, generate program line numbers but instead of Auto on its own having the same effect (as 10 is usually the default value), it turns off the line numbers.

Plus/4 programmers have access to a total of 121 colours (eight luminances of 15 colours plus black), which can all be present together on the high resolution screen.

The high resolution screen has a resolution of  $320 \times 200$  pixels, each of which can be set. The colour of the

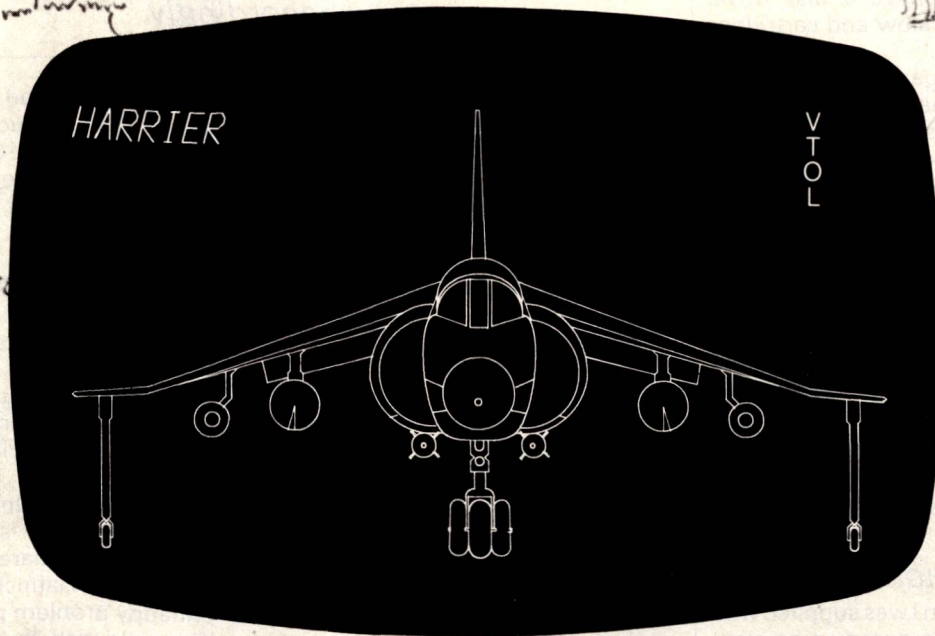
## Benchmarks

|     |       |
|-----|-------|
| BM1 | 2.0   |
| BM2 | 9.8   |
| BM3 | 18.2  |
| BM4 | 18.7  |
| BM5 | 18.8  |
| BM6 | 34.8  |
| BM7 | 55.3  |
| BM8 | 101.1 |

**All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.**



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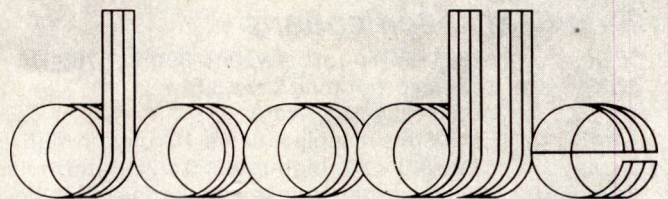
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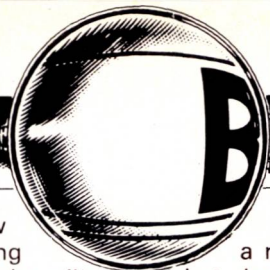


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must be used on a new disk, but if you're recycling a disk then the quick header will suffice, since with the old directory overwritten the disk is effectively wiped.

## Applications software

With the inclusion of built-in applications software the need for other packages is not so great. Indeed it will be difficult for companies to sell Plus/4 owners business programs as they will already own three good packages.

Software might be supplied on three different mediums — cartridge, cassette and disk, but I imagine that disk will be the most-used medium as Plus/4 owners will also have a disk drive. Cassettes are still slow and cartridges are still expensive.

Some cassette games will probably filter up from the Plus/4's younger brother, the C16 (a scaled-down version of the Plus/4 without the built-in software and missing 48k of RAM). This lack of memory may well be a problem for software houses, especially as in high-res mode, the C16 is left with a feeble 2k.

Most of the existing software houses, which produce games for the Commodore machines, were initially sceptical about the Plus/4, particularly those who rely heavily on sprites. This initial resistance will soon pass if the machine sells well, but I doubt whether the typical Plus/4 user will rush out and buy the latest camel-bashing game.

## Documentation

The documentation I was supplied with was undoubtedly preproduction standard. It consisted of piles of photocopied sheets which split broadly into three parts: a Basic tutorial; a 'Plus/4 encyclopaedia'; and a separate guide to the 3-Plus-1 software.

All three were easy to read, and contained many examples and exercises all designed to help you learn more easily. The Basic tutorial clearly explained the simpler concepts of programming through commands and sample programs, leading the user on to the encyclopaedia which presents an alphabetic list of the Basic commands, and contains syntax, an explanation of its purpose and some examples.

Together these forms provide a relatively good guide to Basic but don't expect to learn too many advanced techniques, as all such topics are replaced with a signpost to the forthcoming *Plus/4 Programmers' Reference Guide* (this will cost you extra, probably around £7). Some of the information omitted from the manual concerns the creation of random access and relative disk files: these are better

*'Price is obviously an important factor to consider and the Plus/4 plus disk drive is about £70 more than a QL, therefore the onus is on Commodore to either prove that the extra is worth it, or reduce the price accordingly.'*

and faster than the sequential files dealt with all too briefly in the manual.

I can understand the need for a separate book to deal with using ROM calls and addressing the user port, but syntax for the Basic commands should be in the Basic programming guide. After all, using random access files is far easier than using a machine code monitor.

The final part of the manual is thankfully more comprehensive, and tells you all you need to know about the 3-Plus-1 software.

Each package is dealt with in turn, and full operating instructions are given along with examples and exercises. Each section closes with a command summary and relevant details on integrating the software with other packages.

The 3-Plus-1 manual also makes several references to a demonstration disk, which seems like an excellent idea and would round off an attractive package.

## Prices

The Plus/4 is competitively priced at just under £250. However, you should regard the purchase of a disk drive as compulsory at an additional £220. The whole package carries a price tag of about £470, more than the cost of a QL.

No prices were available at presstime for the cassette player or the new SFD 481 disk drive.

The Plus/4 is about £30 more expensive than the Commodore 64, and there are no plans to reduce the 64's price. Commodore feels that the Plus/4's built-in software and lack of sprites and sound channels will keep the two machines apart; the idea being that games players will buy the '64 and the more serious users will choose the Plus/4.

More direct competition exists be-

tween the C16 and the VIC-20, with the C16 being introduced in a starter pack for £129.95. In true Commodore style, it intends to continue selling the VIC-20 'if the demand exists.'

## Conclusion

So what is the Plus/4's potential place in the market? It has a vastly improved Basic, but also some annoying features. The worst of these are the non-standard joystick and cassette interface, which aren't even compatible with the previous Commodore machines.

Its biggest selling point will be the built-in 3-Plus-1 software packages, which aim it squarely at the QL market. If it had been launched during the QL's unhappy problem phase then it would have sold well, but the QL's problems are now said to be all but over and the machine will be in the High Streets as the Plus/4 is launched.

The potential buyer is faced with a difficult choice. The QL is by far the more innovative product, and the Psion packages certainly outperform the Plus/4's 3-Plus-1 packages. However, Commodore could argue that the Plus/4 uses proven technology and therefore should be bug free. 3-Plus-1 is built into the ROM and therefore instantly available as well as being fully integrated — hence the dilemma.

Price is obviously an important factor to consider and the Plus/4 plus disk drive is about £70 more than a QL, therefore the onus is on Commodore to either prove that the extra is worth it or reduce the price accordingly. After all, the Commodore 64 started life at over £300.

Commodore 64 owners will argue that similar packages to those incorporated in 3-Plus-1 are already available for their machine, but the total cost is almost twice the price of the Plus/4.

The Plus/4 will have an interesting impact on the market-place.

END

## Technical specifications

|             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| CPU:        | 7501 running at between 0.89 and 1.76MHz                                           |
| ROM:        | 32k incorporating Basic 3.5,<br>20k 3-Plus-1 software                              |
| RAM:        | 64k, 60k available to users. 10k used in high resolution mode.                     |
| Display:    | Text (40 × 24), high-res (320 × 200) and multicolour (160 × 200)                   |
| Keyboard:   | 67 typewriter-style keys including four function keys and four cursor control keys |
| Colours:    | 121 colours (15 colours; eight luminances + black)                                 |
| Sound:      | One channel, two tones                                                             |
| Dimensions: | 66.7mm × 422.3mm × 238.1mm (H × W × D)                                             |



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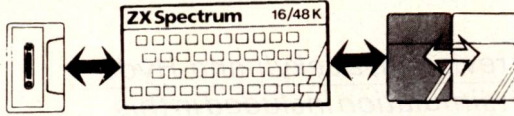
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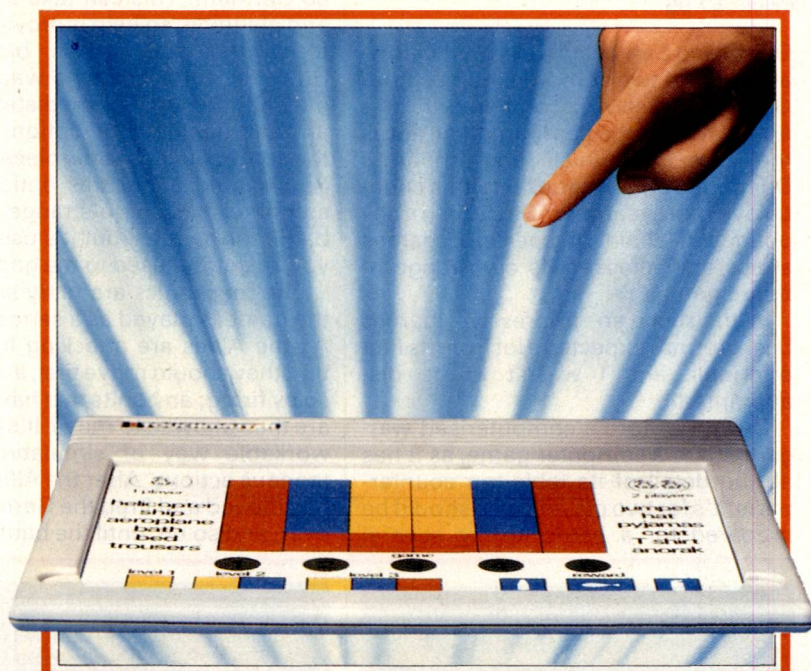
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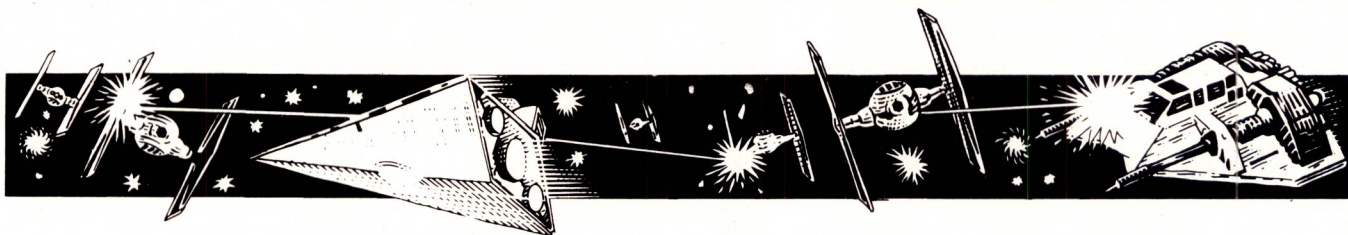
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*Tony Hetherington is the man on the starting block.*



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**Format:** Cassette  
**Price:** £7.95

D-Day and Battlecars (reviewed below) are the first two computer games from Games Workshop, a company which is no stranger to the games market. It was the company which first imported Dungeons and Dragons into this country over nine years ago. Since then it has opened a chain of specialist games shops and released its own range of board games.

With such an impressive games background I expected a lot from its first offerings, and I wasn't to be disappointed.

D-Day is more a computerised war-game than a computer game, as it has all the detail of its table-top counterparts. It's for two players who should be prepared for a battle lasting several



hours.

The game simulates several stages of the D-Day landings including the landings themselves, the push-out and the battle for Arnhem. The stages are represented as scenarios (four in total) which must be individually loaded into a central game system. The first stage is to set up the 100 pieces (40 Allied units, 60 German). This can take some time and planning, so help is provided in the form of maps of the battlefields. However, for those who want to start playing the game immediately there's an auto-deployment option in which the computer places the pieces for you. You should avoid this option as the computer has some strange ideas for battle formations, but it's useful when you're getting used to the game.

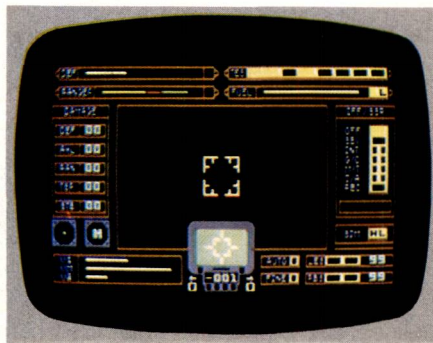
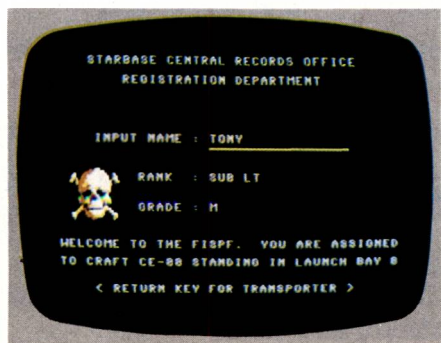
The mechanics are fairly smooth as the game is played as a series of turns. As the Allies are attacking it's logical that they should move first, and they do so by firing; any units that haven't fired are then allowed to move. It's a silly but workable way of simulating simultaneous actions. After the Allied player has moved and fired the Germans take over, and so on, until the battle is won.

One of D-Day's best features is the variety of units available — tanks, infantry, trucks, ships and bridge layers. The tanks and infantry are normal offensive units but all have their own attack, defence, movement and range strengths which determine the relative abilities of the units and their effectiveness in battle. The trucks and ships are used to transport these units around the board to strengthen a weakened flank or start a new offensive. The bridge layers are invaluable and are used to build bridges across otherwise impassable territory, so should be protected at all costs.

Terrain naturally has an important effect on the battle, as it can slow the enemy advance or provide much-needed cover. Roads are crucial, so you should guard them ready for that decisive push.

The playing area, or battlefield, is divided into a 63 × 63 grid, although only 15 × 15 squares are displayed on the screen at any one time in the left-hand of two square windows, with the right-hand being used for messages. For example, 'Place the cursor over the unit to fire and press O': whenever a unit is selected, either for moving or firing, its attack and defence details are displayed at the bottom of the screen.

Comparisons are bound to be made between this game and Atari's Eastern Front, but D-Day is streets ahead. It's by far the more complicated of the two but this adds to the enjoyment, and any problems caused by the Spectrum's screen display are overcome by the inclusion of maps in a package that's excellent value for money.



## Mission impossible

**Title:** Interdictor Pilot  
**Computer:** Commodore 64  
**Supplier:** Supersoft  
**Format:** Cassette  
**Price:** £17.95

The opening screen of this space flight simulator features a superb picture of a



skull, which is appropriate when you consider the new pilot's fate.

You sign in for a mission which will take you across the galaxy and hopefully end safely on board a federation starbase, but many hazards lie ahead before your journey's end.

Your mission is to destroy as many ships of the evil Jahdra-Gallan Alliance as possible without suffering too much damage to your own Interdictor MK III fighter.

The screen display consists of an impressive array of instruments to aid you in your mission, particularly those which help in the difficult process of identifying approaching craft.

There are a number of direction and range indicators and, most useful of all, the transponder. This is a device that transmits and receives identifying signals from other craft, and should help

you to decide whether to run, disengage or fight. A neat tactic uses the ability of your MK III to mimic the signal transmitted by other craft: for example, you approach a Gallanic Cruiser transmitting as if you were a similar craft. Once you are in laser range, open fire.

This tactic has one small drawback — you are never sure that the ship you are about to blow up isn't another MK III employing the same strategy. The penalty for destroying your own ships is severe and should be avoided.

Skilled pilots will be able to distinguish approaching craft by their acceleration rates and relative deflector shield strengths, which could dramatically increase life expectancy as early identification will allow you to warm up your lasers in time. This is crucial as warm-up can take 18 seconds — a long time to wait while someone's taking pot

shots at you.

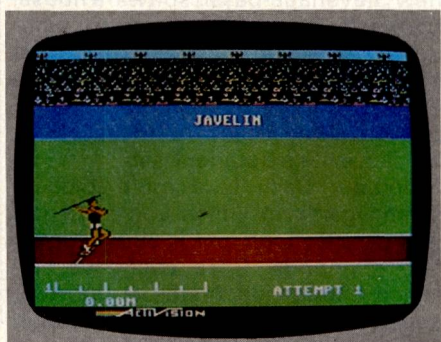
A successful recovery by a starbase is rewarded by promotion and the chance to fly again.

If you'd rather not risk life and limb you can always train on the simulator before flying for real, when your performance is recorded in your career record and can be saved to either tape or disk.

This superb game is completed by an impressive 50-page instruction book, which includes memos from your command warning you that ramming is not an approved method of attack, although it's effective.

Interdictor Pilot is written by a now compulsory RAF pilot, which accounts for the game's realistic feel.

It's not the cheapest game around but, in my opinion, it's certainly one of the best.



## Olympic waggling

**Title:** Decathlon  
**Computer:** Commodore 64  
**Supplier:** Activision  
**Format:** Cassette  
**Price:** £7.95

Can you beat Daley Thompson's Olympic score? That's the challenge of this gruelling game in which you attempt all the decathlon's events in a single

session. You can practise against a computer opponent, but the real challenge is when you play against up to three other people.

The graphics are superb and they move smoothly, and believe me you really feel the strain as you pound around the track. You get your man running his socks off by frantically waggling the joystick from side to side.

It's a simple method but effective, and for once the amount of effort you put into the game directly affects your performance.

In the throwing and jumping events you achieve your best results by

pressing the fire button at just the right moment. The pole vault is the most technically demanding event as it requires a combination of waggling and pressing to get you over the bar safely.

As in the real decathlon you are awarded points based on your performance in each event. A good score of over a 1000 points is met by a fanfare and a cheer from an otherwise silent crowd.

It's unlikely that any two people will be good at the same events, which results in a fascinating contest. In my case I have to score well in the high jump and pole vault in order to build up a sufficient lead to stay in front after the hurdles and 400 metres.

The final event is the 1500 metres and, in my opinion, this is the most demanding, as you have to maintain a fast pace for about three minutes before a gruelling sprint for the line. I'm just glad there isn't a marathon.

It's difficult to find fault with this excellent program, but, after all that hard work, I think it's a shame that there isn't something more interesting than the scores displayed on the screen to congratulate the winner.



## Highway code

**Title:** Battlecars  
**Computer:** 48k Spectrum  
**Supplier:** Games Workshop  
**Format:** Cassette  
**Price:** £7.95

The year is 2081 and motor cars have changed. They are driven by a new breed of gladiators, and are covered in armour and bristle with weapons. They are driven around race circuits and the tight streets of a town in a duel to the death, so strap yourself in and away you go.

You can grapple with either a human or computer opponent, but the human challenge is far more interesting because both players locked in mortal combat are using the same Spectrum keyboard. The control keys used by each player are well laid out, so you shouldn't get in your opponent's way, but before you start you should establish whether tactics such as elbowing are allowed. Joysticks would solve this problem but there are just too many controls required, so the smell of burning rubber (the Spectrum's

keyboard) will literally fill the air as the action heats up.

You have remarkable control over your car as you can steer wherever you want, accelerate and brake, drop oil and nails on the road behind you or to the sides, and fire a laser at most angles.

With all this weaponry around it's incredible that the race actually starts, never mind finishes, as you begin the race with a difficult decision. Do you make a run for it and ambush your opponent later, or do you let him have it straightaway?

The screen display helps rather than hinders the action and is split into three windows. Along the bottom is a display that shows a map of the whole circuit, fuel and speed gauges for both cars, and a much-needed damage display. There is, of course, considerable wear and tear on these cars, so there are pits



# SCREENPLAY

scattered around the track where you can either refuel or have your car repaired.

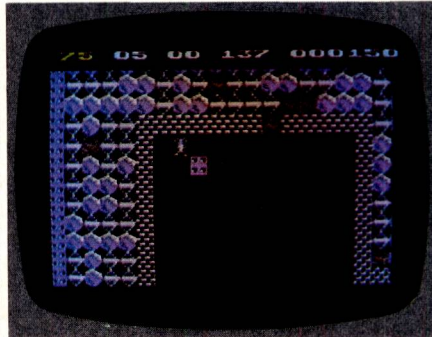
The race around the circuit is nominally a contest over five laps, but the town version drops all pretence as you

start at opposite ends of the town and it's quite clear there's going to be only one survivor.



## Diamonds are a meanie's best friend

**Title:** Boulder Dash  
**Computer:** Commodore 64  
**Supplier:** Statesoft  
**Format:** Cassette/disk  
**Price:** £8.95/£10.95



Boulder Dash is the third release by a new Stevenage-based software house, Statesoft. Its aim is to import high-quality American software with the first releases from First Star. The others are Flip Flop, a Qbert variant and a super zap-em game called Astrochase, but my favourite's Boulder Dash.

Boulder Dash is a multi-scrolling screen game in which you must dig your way through rock in an attempt to find diamonds. Once you have collected enough diamonds, a doorway appears and you can progress through

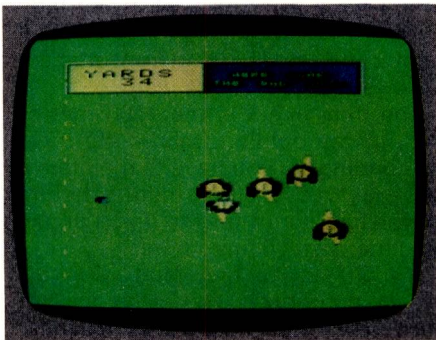
to the next screen.

However, also in this rock are a number of boulders which will fall on your head if you dig under them, but if you're quick enough you can get out of the way.

This is more than a little reminiscent of an arcade game called The Pit, but Boulder Dash takes that simple idea to its limits. For example, the boulders don't just plummet straight down: they collide and bounce off each other. Knocking one boulder can start an avalanche. Every screen is different and therefore each requires a new set of tactics.

Some screens have diamonds guarded by meanies in enclosed areas, others have free-roaming meanies, and one doesn't appear to have any diamonds. All you can see is a huge green amoeba that's getting bigger by the second, and lower down the screen a trapped group of meanies.

It's up to you what you try, but I'm sure whatever you pick you'll enjoy the challenge.



## It's an up-and-downer!

**Title:** Superbowl  
**Computer:** Dragon 32  
**Supplier:** Cable Software  
**Format:** Cassette  
**Price:** £6.95

Poor Floyd has it all to do. You're a running back for the Dallas Cowboys and have to catch the ball and run 100 yards to score a touchdown. And you've got four downs to do it in.

Unfortunately, realism has taken a time out during this game as you're completely on your own. Not only that, the opposition, the Washington Redskins, seem to have more than 11 players on the pitch. In a memorable 34-yard run, I passed no more than 23 Redskin defenders.

The game is simply four attempts to run a total of a hundred yards dodging lunging defenders as you go. Get clobbered for the fourth time and the game ends with a report on your progress.

That's all there is to it. It's not exactly a simulation of American football but the game-starved Dragon owners will probably like it. It will have to be drastically modified if it's to stand conversion to any other machines where the games market is more competitive. Indeed, if the Dragon is to make anything of its reincarnation the standard of its games must improve.

Superbowl is fun but it's a limited game which won't have the cheerleaders waving their pompoms.



## Of critters and crystals...

**Title:** Swords and Sorcery  
**Computer:** BBC B  
**Supplier:** Kansas City  
**Format:** Cassette  
**Price:** £10.35

Kansas goes to great lengths to explain that its new game, Swords and Sorcery, is a quest rather than an adventure game; the difference being that you're no longer alone, and control a party of unlikely characters in an attempt to retrieve four crystals that were once a princess.

It's more a cross between an adventure game and a maze game, as the crystals are dispersed throughout a randomly generated maze. This maze is

populated by a motley collection of critters including wizards, priests, goblins, hobgoblins and madmen, who you'll meet at frequent intervals and may either join your party or attack you. This can lead to death and a chance to play again, or you can go on to explore more of the multi-level maze as your quest continues.

The game is well programmed and contains some nice features, such as the function keys used for single key entry of commands like fight, take and drop.

Add to that a strange wailing noise coming from the Beeb to accompany your efforts and you've got a fun game.

END



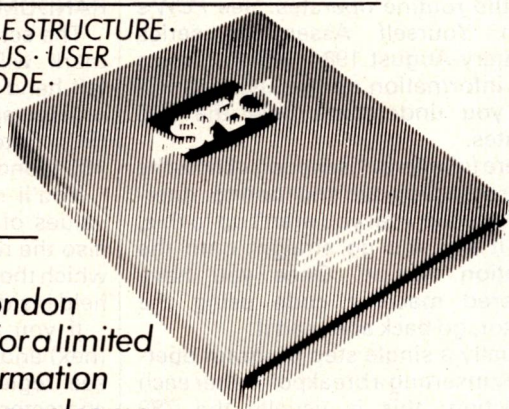
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# One step at a time

*As programming in Basic on a micro is interactive, it's often easier to debug a Basic program by correcting errors as they are flagged at run time; to do the same at machine code level you need a program known as a monitor. Nick Ryman Tubb's Spectrum monitor allows you to single step through machine code programs in order to debug them.*

A single step program is probably the most useful debugging tool a machine code programmer can have. It allows him to check his code by stepping through each instruction one at a time, while onscreen the registers and memory are displayed continuously.

At the press of a key the current instruction pointed to by the program counter is executed. Any effect this instruction has will be displayed on the screen. The programmer can then, if need be, change register values, look through or change memory, or simply execute the next instruction.

Single stepping teaches you how each instruction works by giving you a window into your computer. You can try out any instruction, sets of routines given in text books or any of the PCW SubSet Z80 routines.

As you step through the code you'll see exactly what is happening, and this will increase your understanding of how the routine operates. See PCW's Teach Yourself Assembler series (February-August 1984) which gives a lot of information on the Z80, and will help you understand how the Z80 operates.

There follows a description of how the single step program and monitor operate. If you feel that you aren't up to this, miss it out and go straight onto the operation section. Once you have mastered machine code using the monitor, go back and read it!

Usually a single step program operates by inserting a breakpoint after each instruction; this is usually the Z80 restart (RST) instruction. However, this type of mode zero interrupt is not available for use on the ZX Spectrum (or other zero-paged ROM systems).

This program uses a separate area of main store memory to which instructions are transferred — one at a time. The instructions can be modified, if necessary, and then executed. This method allows the ROM to be stepped through — like the hardware single step on the Nascom 1 computer.

A Basic hex loader program (Fig 1) has been included to enable you to type in the hex from the listing directly. You

must type in the hex code, two digits at a time, from the hex dump/flowchart. Once you have typed in the Basic program, and saved it, type RUN <enter>. The program will then ask you for the decimal starting address (that is, 60000). After typing this in you can then proceed to type in the hex, one byte at a time. Push RETURN after each byte.

The main program (Fig 2) comes in two parts: the single step routine and the monitor. When the first part has been typed in you must push SHIFT+SPACE. Now type RUN and enter the starting address as 61008. You can now type in the second half of the machine code.

When the program has been typed in, break out of the hex loader (SHIFT+SPACE) and save it by: SAVE "monitor" CODE 60000, 1268 <enter>

Once the machine code has been saved type: RANDOMIZE USR 60000 <enter>

The screen will clear and a question mark will be displayed at the top left-hand side of the screen. The program is waiting for an execution address (PC). Enter this in hex (for example, 18C1) and push enter.

You'll notice that not only are the values of the registers displayed, but also the next five memory locations to which the register is pointing (these are held inside brackets).

If you start with the address 18C1 (hex) and push 'z' several times, you'll see registers changing; then all the characters on the screen will start to flash. This is because you have just stepped through a ROM routine which makes them flash!

## Principle of operation

When the program is run and the user's program counter ('PC') set up, the first instruction is transferred to the buffer area. Here it's tested to find out if it's a change of control op-code (that is, does the program counter need to be changed?).

If the instruction is not a transfer of control (that is, a non-branch instruction), a three-byte jump is inserted after

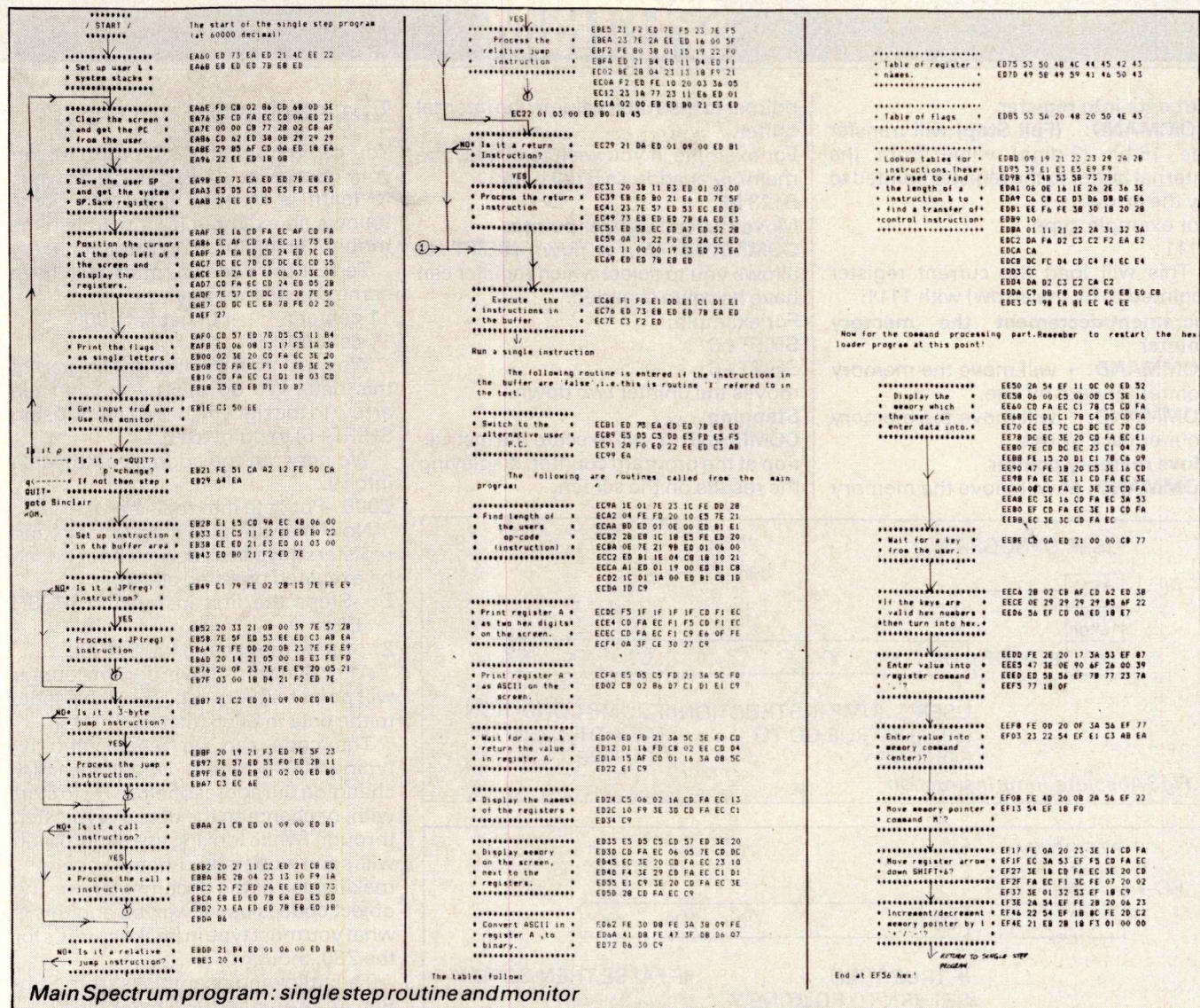
```

10 REM *****
20 REM **Hex loader program**
30 REM *(C)TubbResearch,1984*
40 REM *****
50 CLS
71 PRINT INVERSE 1;"ADDRESS";
  INVERSE 0;" ";INVERSE 1;
  "CONTENTS";
  INVERSE 0;" ";INVERSE
  1;"INPUT"
75 FOR y=1 TO 20
76 LET x=0
80 LET i=4: LET b=add: GOSUB
  1000
90 LET i=2: LET b=PEEK add: LET
  x=10: GOSUB 1000
100 LET x=20
105 LET a$=""
110 PRINT AT y,x;a$;FLASH 1;
  INVERSE 1;"?"
111 PAUSE 4e4
120 LET i=INKEY$: IF i$="" THEN
  GOTO 120
130 IF CODE i$ <> 13 THEN LET
  a$=a$+i$: GOTO 110
135 IF LEN a$ <> 2 THEN GOTO 215
140 LET t=0
150 FOR p=1 TO 2
160 LET a=(CODE a$(p))-48
170 IF a>9 THEN LET a=a-39
180 IF p=1 THEN LET a=a*16
190 LET t=t+a
200 NEXT p
210 POKE add,t
215 LET add=add+1
220 PRINT AT y,x;a$;" "
230 NEXT y
240 GOTO 70
1000 LET a$="": LET a=0
1010 LET c=(b/16-INT(b/16))*16
1040 IF c<=9 THEN LET
  a$=a$+CHR$(48+c)
1050 IF c>9 THEN LET
  a$=a$+CHR$(55+c)
1060 LET b=INT(b/16)
1070 IF b<>0 THEN GOTO 1010
1080 FOR i=LEN a$+1 TO 1
1090 LET a$=a$+"0"
1100 NEXT i
1110 FOR i=LEN a$ TO 1 STEP -1:
  PRINT AT y,x;a$(i TO i);:
  LET x=x+1: NEXT i
1120 RETURN

```

Fig 1 Hex entry program listing





the user's op-code in the buffer area and the buffer is then executed. The Z80 will execute the user's instruction and the jump; this jump directs control to the single step program which then displays registers, flags and memory contents.

In the case of absolute jumps the jump op-code is transferred to the buffer and the operand (that is, address) is saved. A new operand is copied into the second and third bytes of the instruction so that the jump, if the condition is true, will pass control to routine 'y'. A second jump is copied after the first which points to routine 'x'. If the jump operation fails, control will be passed to routine 'x'.

After the buffer is executed control will be passed to either routine 'x' or routine 'y'. The program counter can then be updated as need be, and the next instruction fetched (Fig 3).

Relative jumps are converted to their absolute jump equivalent and processed as absolute jumps. Call instructions are also converted to their jump equivalent. A return address is pushed onto the stack, and the call is treated as though it were a jump.

A return instruction is transferred to the buffer followed by the three-byte

jump to routine 'x'. The return address is unstacked and saved, and the address of routine 'y' is put onto the stack. The buffer is then executed (Fig 4). For all the instructions mentioned so far, the conversions set out in Fig 5 are used.

The 'DJNZ' instruction is converted to the two instructions, DEC B JP NZ, <abs> where the absolute address is calculated from the relative address using the same routine as the relevant jumps (since DJNZ is relative). Jump to register instructions are never directly executed. The target register value is collected and placed in the program counter, and the next instruction is executed:

|         |         |         |
|---------|---------|---------|
| JP (HL) | JP (IX) | JP (IY) |
| !       | !       | !       |
| PC=HL   | PC=IX   | PC=IY   |

Restart instructions are executed in the same way as non-branch instructions (Fig 6).

## Monitor commands

Eight commands are available from within the monitor. These enable the

user to change the data in memory, in the program counter or in a register selected by the user. Documentation of these commands is as follows:

### Change Program Counter

**COMMAND: P** allows the program counter to be changed anywhere in the 64k of addressable memory. After the command is typed, the screen will be cleared and a question mark displayed at the top left-hand of the screen. You can now type address and push 'ENTER'.

### Quit

**COMMAND: Q** resets all the I/O vectors and returns to the Sinclair Basic mode.

**Hex Entry (1-9, A-F):** these make up the 8- or 16-bit binary numbers which can be entered. Pushing any of these keys stores their value in an internal buffer until another command is executed.

### Put data into memory

**COMMAND: <ENTER>** will enter the data in the buffer to memory and increment the memory pointer.

For example, type:

11 <ENTER>  
22 <ENTER>  
33 <ENTER>

This will enter the values 11,22,33 (hex) into three consecutive memory locations.



## Put data into register

**COMMAND:** . (Full Stop) will transfer the 16-bit (2-digit) value from the internal buffer to the register pointed to by the arrow.

For example, type:

1111.

This will load the current register (pointed to by the arrow) with 1111.

## Increment/decrement the memory pointer

**COMMAND:** + will move the memory pointer forward by one.

**COMMAND:** - will move the memory pointer back by one.

## Move memory pointer

**COMMAND:** M will move the memory

pointer to the 16-bit value in the internal buffer.

For example, if you wish to display the memory at address B123 type:

B123 M

## Move current register pointer

**COMMAND:** Cursor down (SHIFT+6) allows you to select which register can have its value changed.

For example:

SHIFT+6

SHIFT+6

moves the pointer two down.

## Stepping

**COMMAND:** Z will execute the instruction at the program counter, displaying the results on the screen.

## Trial and error

You can try out any Z80 programs on your Spectrum — one of the best ways to learn is by trial and error. There follows an example of how to use the monitor using the PCW SubSet pages.

To test the code we must also have some data in memory:

11<enter> -Put data at C006

11<enter>

We must now point HL to the start of this data. We do this by moving the arrow to the right of the registers (using SHIFT+6) to point to HL.

We now put the address of the data into HL:

C006. -Put data into register

Now that the object code, data and registers have been set up, the code can be executed one step at a time:

Z -Steps the first instruction (PUSH DE)

Z -Steps the second (LD E, (HL))

After five steps the program counter will point to C006, and HL will be equal to the data in C006 (that is, 1111).

The code can be re-executed by typing PC000<enter> and you can try changing the address held in HL to start with, or changing the data. As you step through (while looking at a listing), you will soon understand how it operates making use of the documentation. The object code is usually given and this is what you must type in (make sure it's for the Z80, though!).

The following example is from Sub-Set, PCW August 1982, page 146.

The instruction 'LD HL, (HL)' is not supported by the Z80 CPU (a reader submitted some code to simulate this instruction). The code will load the register pair HL with the contents of memory pointed to by HL.

The code to do this is given below:

```
PUSHDE          D5
LDE,(HL)        5E
INCHL           23
LDD,(HL)        56
EXDE,HL        EB
POPDE           D1
```

Load the monitor by :LOAD "monitor"CODE. Execute the monitor by: RANDOMIZE USR 60000, and type in the start address of the code: C000 <enter>

We now want to enter the six hex bytes given on the right above:

```
C000M          -This moves memory to C000 hex
D5<enter>      This puts D5 at C000 and moves memory by one.
5E<enter>      This puts 5E at C001
D1<enter>      This put D1 at C005
```

Note that the single step routine will not work if you execute any of the three following instructions:

```
RETI (op-code ED40)
RETN (op-code ED45)
DI (op-code F3)
```

END

## USER'S PROGRAM

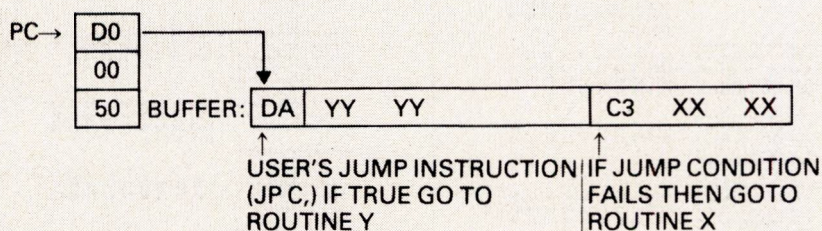


Fig3 Absolute Jump Instruction

## PROGRAM

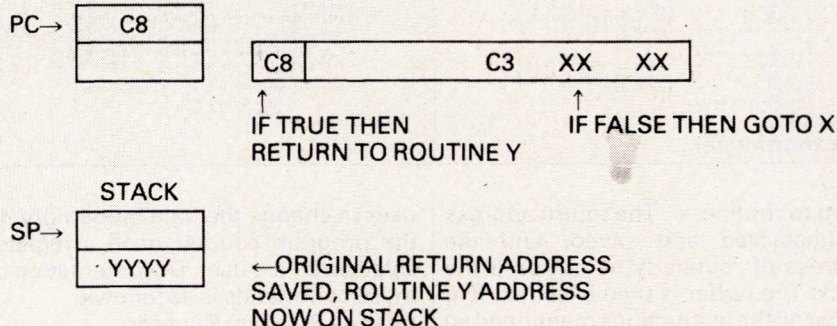


Fig4 The return instruction

| = CONDITION | = CALL | = JUMP | = RELATIVE | = RETURN | = |
|-------------|--------|--------|------------|----------|---|
| = C         | = DC   | = DA   | = 38       | = D8     | = |
| = M         | = FC   | = FA   | =          | = F8     | = |
| = NC        | = D4   | = D2   | = 30       | = D0     | = |
| = NONE      | = CD   | = C3   | = 18       | = C9     | = |
| = NZ        | = C4   | = C2   | = 20       | = C0     | = |
| = P         | = F4   | = F2   | =          | = F0     | = |
| = PE        | = EC   | = EA   | =          | = E8     | = |
| = PO        | = E4   | = E2   | =          | = E0     | = |
| = Z         | = CC   | = CA   | = 28       | = C8     | = |

Fig5 Instruction conversion chart

## PROGRAM

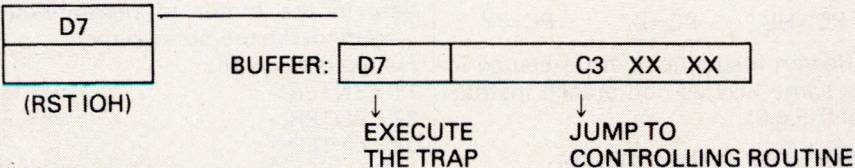


Fig6 The restart instruction



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# Mind over matter

Research is currently under way into the building of a computer with the power to mimic the awesome processing structure of the human brain. Michael Stevens reveals some remarkable similarities between recent innovations in computer technology and the way in which the brain works.

Nothing short of immortality (and a king's ransom) awaits the designer of a computer system capable of intelligent behaviour of the same scope and power as the human mind. Despite this attractive prize, Artificial Intelligence (AI) researchers are not single-mindedly trying to create machines in their own image.

Computer technology, more than any other development in the history of mankind, has emphasised human fallibility and shown us that our way of doing things is not necessarily the best. Computers already surpass the brain as number crunchers and organisers of massed information because they do it in a more efficient way.

## Unreliable access

If you've ever fumbled in vain to recall that piece of information on the tip of your tongue, you'll be aware of one of the major failings of the brain — the unreliability of access to its database. Even though the power of the brain's memory system is greater than any computer system yet conceived, the way it achieves this power creates the occasional bug which temporarily fouls the system. In addition, the major part of the brain's 'work' is carried out in the short-term memory which, like the Von Neumann arrangement of a Central Processing Unit (CPU) mediating between input, memory, and output, has a limited processing capacity. It can only hold about seven or eight pieces of information at one time, but it does excel in being able to swiftly change its contents according to the many demands made upon our attention.

This facility is provided by the most important structure in the short-term memory system, known, unfortunately, as the *hippocampus*. We actually have two of these, one in each half, or hemisphere, of the brain, specialised for logical sequences and patterns of information. The hippocampus compares sets of information to discover their similarities and differences; it evaluates the importance of information by comparing it with past experience recorded in the memory, and decides how it should be processed. It's as sophisticated filing mechanism which selectively routes information to va-

rious processing systems, including its proper location in memory, by drawing upon the whole of the database (or past experience) for its operating instructions.

## Novelty and habituation

By comparison with previous experience the hippocampus can determine when a specific state exists, or when certain conditions are fulfilled. It's essential to the 'interrupt' and 'stop' functions which decide when specific programs should end, and when the content and direction of information processing should be changed. The hippocampus also helps determine the importance of particular tasks or events by comparing them with experience stored in the database, so we can devote the necessary processing resources to them. Wired into this system is a particular sensitivity to *novelty*, which has obvious survival advantages. It's also partly responsible for *habituation* to repeated stimuli, enabling the brain to jump familiar intermediate steps in processing, and preventing wastage of limited processing resources on 'uninteresting' events.

Both these facilities have been recreated at a conceptual level on computer systems. For example, Douglas Lenat's system designed to formulate mathematical concepts has several primitive equivalents initially built into it at a high level. One of these is an interest in sets of information which fulfil a number of criteria, including the equivalent of novelty (a new set of information) and habituation (a common set of information). Lenat's system is therefore able to sort new information to discover how it compares with that already stored in the database, and determine what processing action is necessary — a facility much the same as that provided by the hippocampus in the human brain.

Using such high-level concepts, computers can mimic functions of the brain without becoming involved in the mechanical complexities of how the brain works.

## Motivation

Another area in which 'mimicry' has been achieved is the computer equiva-

lent of human motivation. An important influence on motivated behaviour is the emotions, which are essential in giving direction and personal meaning to our thinking and behaviour.

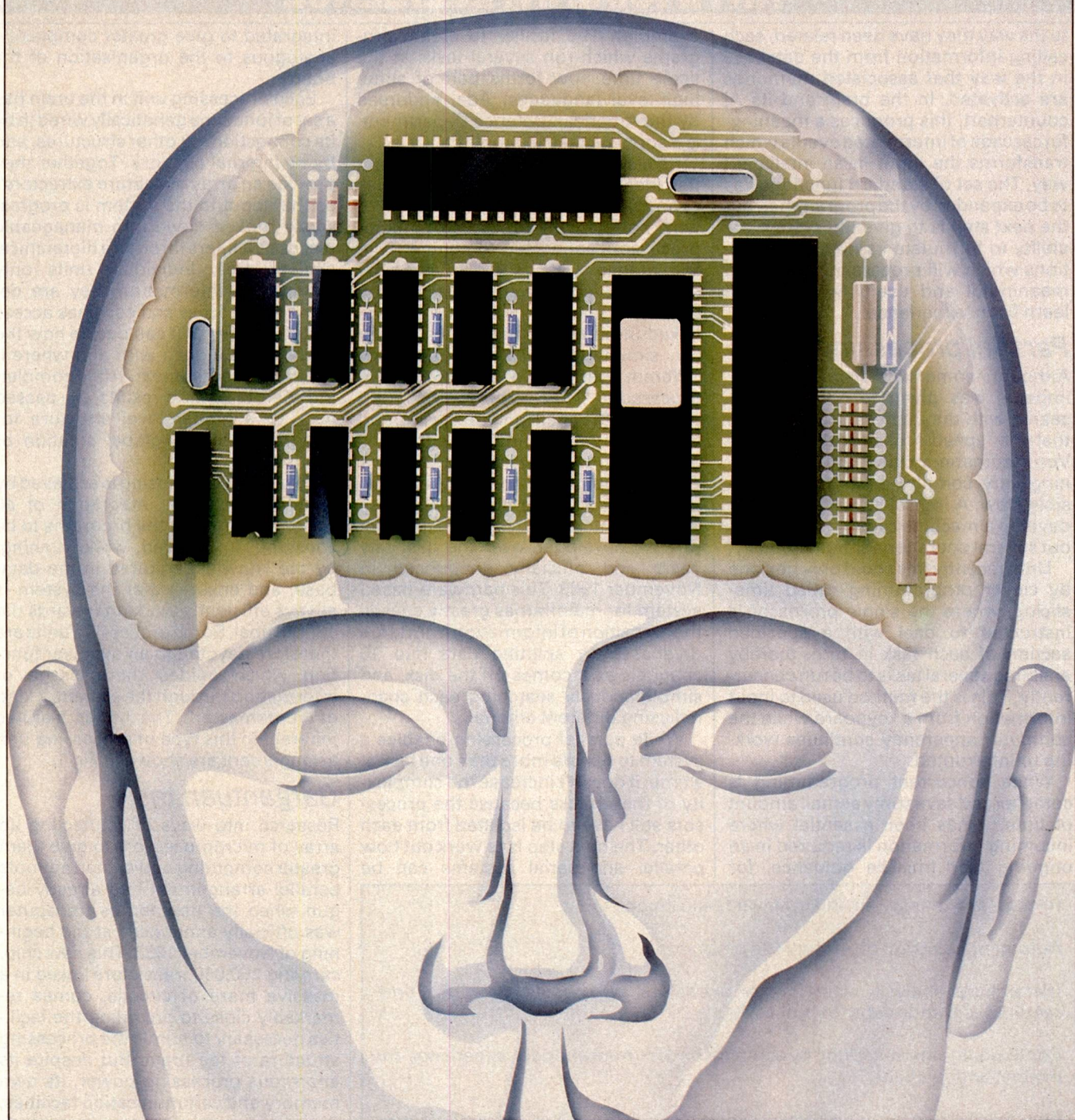
To produce an AI system of significant complexity, we would have to give it something analogous to the emotions. At present this is done by weighting — instructing the system that a particular event or set of circumstances has more value (or gives greater pleasure?) than others in terms of whether they begin to achieve the intended goals of the system. Weighting may be ideally suited to chess programs and the like, but brief consideration of the variety of human motives highlights the complexity and even the undesirability of following this line of research.

Even so, emotions result from assessing the personal meaning and value of experience at any particular moment; this is achieved by comparing our current situation with past experience. For a computer to do this it would need to learn from experience as we do — a researcher's dream. Such a system would be able to change its processing strategies according to its past mistakes and successes — the fundamental basis of all intelligent behaviour.

At birth our brain has a genetically determined pattern of 'wiring'. As we develop our experience is analysed and split into its different components, which are routed throughout the brain in fixed patterns representing specific experiences. Like the picture on a jigsaw, they only reveal their full meaning when all the pieces are in the correct place. Each time the brain processes information, the content of that information fractionally alters its circuitry. In this way, rules for manipulating information (or fitting together jigsaw pieces) gradually evolve, and the programs which coordinate information processing through the various systems of the brain are formed. The world model, which is gradually deposited in the brain's circuitry in this way, guides our thinking and behaviour.

There are two basic ways of producing AI systems which could function with an 'adult' understanding. Either





they're supplied with the knowledge we acquire as we grow up in a similarly organised way, or we create systems which learn as they 'experience' various situations. Both these approaches present enormous problems for the AI researcher. For example, how exactly are rules, concepts and values (its programs) represented in the brain and how do we learn them? Currently we seem to be making more progress in the area of supplying AI systems with their world knowledge ready-structured in high-level languages. The primitive computer equivalent of information stored in the brain is the keywords and patterns which form the database of some AI programs.

By association input to the brain triggers specific patterns of recalled

information, depending on the content of the input and the memory structure which has evolved from previous input. This information is therefore part of a much larger and immensely complex web of interrelated data, and when one piece of information is recalled (like taking one piece of a jigsaw) it has a fixed relationship to the whole of the memory structure (or jigsaw picture) — the whole of our past experience. In this way, contextual rules, relationships and associations are automatically assigned to input and determine the way it's to be processed (or where the piece of jigsaw fits).

The fifth generation languages, Logo and Prolog, both usually written in Lisp, are moving towards the provision of a conceptual framework that will mimic the huge range of relationships among

data and the rules governing them, which are created in the ramifying structure of the brain. These languages enable us to simulate complex data structures, but avoid the problem of copying the brain's processes. High-level languages are therefore one way of producing a database of the kind which evolves in the brain through learning.

The so-called 'declarative' languages like Prolog enable us to describe relationships between data rather than instructing a processor to manipulate it in a particular way. Instead of defining the procedure for solving a problem, they have the facilities for definition of the rules governing its solution.

When a program written in this type of language is run, the standard functions call upon one another according



to the way they have been related, each calling information from the database in the way that associated memories are activated. In the brain and its AI counterpart, this produces a meaningful cascade of interrelated events which transforms the input in an intelligent way. The set of standard functions has to be expanded by the programmer, but the next step is to give the system the ability to formulate its own new functions which will process input in more meaningful and useful ways. It will learn from 'experience'.

## Parallel processing

Although some will dispute it, new impetus was given to computer research with the depressing realisation that the 'speed limits' of the existing Von Neumann architecture make running very complex programs impossibly slow. A logical step was to try to develop a machine capable of carrying out several operations simultaneously.

Until recently this could only be done by clever programming called time-slicing, where the single processor is instructed to deal with a specified section of each task in turn, thereby enabling several tasks to be run concurrently. This is the method used to input information from a keyboard while the computer apparently continues working uninterrupted.

While concurrent programming is complex and saves only a small amount of time, it has been essential where incoming information is required in an ongoing task (missile guidance, for

example). The facility to create programs which run several tasks at the same time now forms part of some high-level languages. Ada, endorsed by the American Defence Department, is a sophisticated example.

Realising that time-slicing was not the ideal solution, the question was soon asked: 'Instead of using one CPU, why not use a collection of microprocessors connected together?' True 'simultaneity', as it's known, has now been achieved on systems using more than one microprocessor, which are linked in parallel so theoretically they can simultaneously handle as many different operations as there are microprocessors. This will eventually do away with the need for time-slicing, and the Occam programming language is designed to take advantage of systems with multiple microprocessors. One application of the parallel channel idea is ICL's Content Addressable File Store (CAFS), developed over the past few years and officially announced in November 1983. This hardware-based system for mainframes greatly speeds the extraction of information from large databases by splitting data into 16 channels as it comes off the disk, and simultaneously searching each channel using different criteria.

While parallel processing enables a system to handle more than one task at a time, it doesn't increase the complexity of these tasks because the processors still have to be isolated from each other. The next step is to work out how parallel and serial systems can be

integrated to give greater complexity, analogous to the organisation of the brain.

Each processing unit in the brain has a set of functions genetically wired in by its connections to other structures, and by its internal circuitry. Together they provide an array of 'feature extractors', so that input to the system is progressively broken down into manageable pieces as it filters through a hierarchical analytic tree. Individual units only receive the information they are designed to process and each has access to a database, so it can decide how the input is to be dealt with and where it should be routed next. After completing their tasks, the results are passed back to a higher level structure for integration into a global solution or routine.

Purposeful processing is achieved by serial and parallel integration of all units. This enables the programs to be constantly monitored, while running, by the knowledge stored in the database, and ensures that the system is always efficiently working towards the correct goal. Some processing units are therefore devoted to an overseer function which guides the passage of information through the system, a kind of 'routemaster'. The major features inherent in this type of processing unit arrangement are shown in Fig 1.

## Gargantuan task

Research into ways of connecting an array of microprocessors to give them greater computing power than a simple parallel arrangement had already begun when the new Inmos transputer was officially announced at the beginning of November 1983. This new chip, carrying 250,000 transistors linked in a massive maze of circuits, comes remarkably close to providing the facilities necessary to mimic the processing structure of the brain. But despite its enormous processing power, its own memory and communication facilities, the next step — using the transputer to create a truly intelligent machine — is a gargantuan one. How do we connect them in the appropriate configuration, and what selective modifications need to be made to their internal architecture to suit specific functions?

At London's Imperial College, a team is already exploring the use of multiple arrays of interacting transputers. Designated the Alice (Applicative Language Idealised Computing Engine) Project it will combine 64 transputers in a sophisticated knowledge-based system. The team hopes to have a prototype running by 1985, and its progress could tell us how well suited this new chip is to AI applications.

With the wider use of this and similar innovations, we can expect a period of accelerated advancement in computer technology.

END

Recognition of relevant and irrelevant data among input.

Automatic selection of appropriate programs.

Hierarchical analysis, with feature extractors, which cuts down the time required and adds depth to processing.

Continuous pattern-seeking by comparison of current and past 'experience' for content and relations.

Concept and rule formation which evolve through the analysis of 'experience'.

A dynamic system which allocates limited processing resources according to perceived needs.

An emotion equivalent to providing 'motives' for action and to guide information processing.

Capable of learning — keeping track of all processing and continuously rewriting programs to accommodate new 'experience'.

Automatisation of habitual strategies to conserve limited processing resources.

Relational databases whose mapping is determined by the probability of relations among data, and between data and rules, and which are updated by 'experience'.

Full compatibility in the structure of a program's subserving functions like attention, memory, learning and concept formation.

Fig 1 Major features of a human-like AI system



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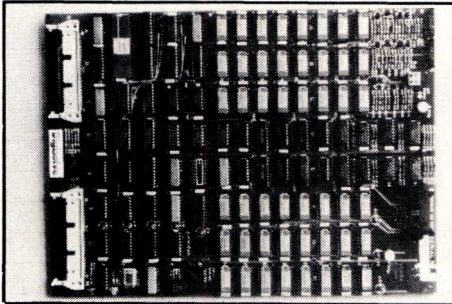
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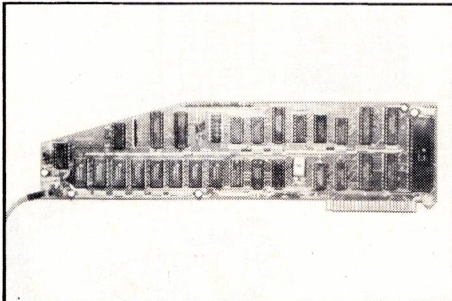
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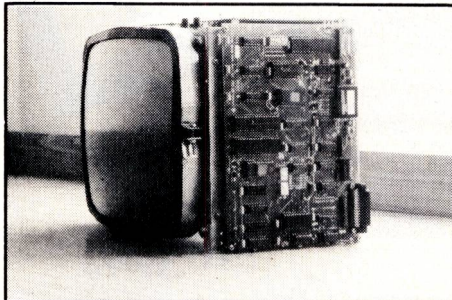
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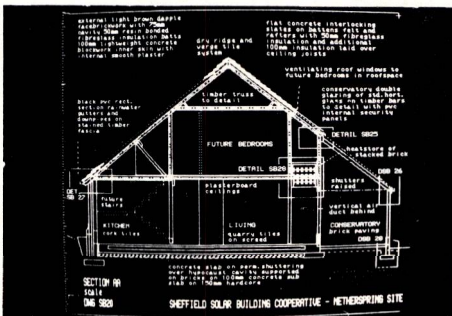
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# A friendly approach

*It's the little things in life that count, or so says Peter Gerrard as he suggests ways of solving minor programming problems on the Commodore 64 before tackling the larger, more infamous ones.*

One of the great problems facing any Commodore 64 user is the lack of commands to enable him to use graphics and sound. This is a well-known failing of the machine, and has been much lamented and criticised in the past.

However, there are other less spectacular but rectifiable failures, so I'll take a look at some of them and offer one or two solutions.

## Input

The first major failing is on the INPUT statement. As Commodore users will know, it takes the following form:

```
10 INPUT A$
```

or

```
10 INPUT "NAME PLEASE";A$
```

In a badly written program, this can cause many problems for the unwary. If the user, by mistake or design, presses the RETURN key, then A\$ will contain a null string and cause all kinds of problems at a later stage.

But there are simple ways around this. You could add to the oneline above in the following way:

```
20 IF A$ = "" THEN TYPE SOMETHING IN! : GOTO 10
```

However, this is not a very professional way of solving things, and is hardly likely to inspire confidence in anyone using the program. One could, for example, type SHIFT and RUN/STOP and, with perseverance, break out of the program. Another common way of preventing the problem is as follows:

```
10 INPUT "NAME PLEASE * [3CL] "; A$
```

Here, a flashing star will appear in place of the cursor ([3CL] meaning 'press the cursor left key three times'), and a line like:

```
20 IF A$ = "" THEN ? "[2CU]": GOTO 10
```

will trap the pressing of the RETURN key on its own, as that action will put an asterisk into A\$. Even this is fraught with danger though, since the user can easily use the cursor keys to move the cursor around the screen and thoroughly ruin everything. One possible solution is to use a routine as shown in Fig 1. We'll go through this line by line in a moment, but first of all here's a brief

outline of its capabilities.

**Input subroutine:** the routine only allows the user to enter characters whose ASCII (or rather COMSCII) value is less than 96. That is, the cursor keys cannot be used to disturb the input prompt, the shift key cannot be used in conjunction with any character, and by some later checking a RETURN over a null string will not be allowed to drop through.

**Explanation:** line 6 CHR\$(8) inhibits the action of the shift and Commodore logo keys combined; CHR\$(9) gets it back again. The latter part of the line clears the screen and turns the print mode to yellow.

The 'Now what' prompt is printed up by line 10. Note the italicised 'N' in the word 'Now': this is the Epson FX80 printer's way of saying that it doesn't like Commodore 64 upper case characters. When you enter the program, enter everything in normal mode and use the shift key to get that 'N'. The latter part of the line sends control to the master subroutine.

Line 12 is an option. Line 15 prints out what was typed in just to prove it, and goes back for another input.

Our comment string CM\$ is declared to be equal to zero in line 60014. Line 60015 prints CTRL and 9, a space, CTRL and 0, and a cursor left respectively. Ignore the commas — they are only present to make the listing more legible, but don't forget that all-important semicolon at the end.

Line 60016 is a straightforward GET loop, which will wait until a key is pressed. The ASCII value of the key pressed is checked in line 60017, and if it's greater than 95 then we don't want to know, so back to line 60016 again. If you only wanted a numeric input, for example, you could check for ASCII values in the range 48 to 57, not forgetting 13 for a RETURN key press and 20 for the DELETE key.

Line 60018 checks the length of the input string, and if it's greater than 20 characters go to line 60022. Again, this limit can easily be changed to suit your own requirements.

If the ASCII value is greater than 31, line 60020 adds that character to our input string CM\$, and echoes the character onto the screen before going back to line 60016 for more. If the ASCII value was 13 (the RETURN key has been

```
6 PRINT CHR$(8):PRINT"[CLR.YEL]"
7 REM INHIBIT CBM LOGO AND SHIFT KEY ACTION
8 POKE53280,0:POKE53281,0:POKE53272,23
9 REM BLACK BORDER. BLACK BACKGROUND. AND UPPER/LOWER CASE
10 PRINT "NOW WHAT ":GOSUB60000
12 IF CM$="QUIT"THENPRINT"[CLR]END":END
15 PRINTCM$:GOTO10
60000 REM *****
60002 REM * INPUT SUBROUTINE *
60004 REM *
60006 REM * PCW 1984 *
60008 REM *****
60014 CM$=""
60015 PRINT"[RVS.SP.OFF.CL]":
60016 GETZ$:IFZ$=""THEN60016
60017 Z=ASC(Z$):IFZ>95THEN60016
60018 ZL=LEN(CM$):IFZL>20THEN60022
60020 IFZ>31THENCM$=CM$+Z$:PRINTZ$:GOTO60015
60022 IFZ=13ANDZLTHENPRINT" ":RETURN
60024 IFZ=20ANDZLTHENCM$=LEFT$(CM$,ZL-1):PRINTZ$:
60026 GOTO60015
```

READY.

Fig 1 Input subroutine



pressed) line 60022 checks that the length of the string, ZL, is greater than ZL (here we're simply checking to see whether it has any length or not, which are of course the same thing since you can't have a negative string: don't all write in at once). If it's greater, the line prints a space and returns from the subroutine.

If the ASCII value was 13 (the delete key) and the input string has a length greater than zero, line 60024 reduces the input string using the LEFT\$ command and echoes that delete key press onto the screen.

Finally, line 60026 trots back to line 60015 to start anew with the next character.

This is a general purpose routine that can easily be changed to suit specific purposes. You can also remove the function of the STOP key, which is the only way of breaking into that routine; this is achieved by a POKE808,239 and line returns to normal with a POKE808,237.

As a general rule, don't do this until you're sure the program is working correctly, since there are few things more annoying than making numerous alterations to the program, running it, and then discovering that you can't break into your now totally crash-proof program to save the new version.

## User-friendliness

The program outlined above is easy to use and simple in operation and illustrates the principle of user-friendliness. However, it's a shame to spoil a program for a ha'porth of bytes, and all too often most of us have come across commercial programs that seem to do everything right, but have one or two niggling little errors which convince us that really, the program isn't very good at all.

## Common problems

Inputs, like certain people, never seem to go away, and one of the most common mistakes made in programs is this:

```
10 PRINT "ANOTHER GAME (Y OR N)?"
20 GETA$: IFA$ = "" THEN 20
30 IFA$ = "Y" THEN 1000: REM
  ANOTHER RUN
40 SYS64738: REM RE-SET THE
  MACHINE
```

The programmer has assumed that the user, by the act of not pressing the 'Y' key, does not want to play another game. It's all too easy to press the wrong key, here with dire consequences. A check along the lines of:

```
40 IFA$ = "N" THEN PRINT "BYE.": END
50 GOTO 20
```

Another frequent problem is not inhibiting the action of the Commodore logo and shift keys in games that use high resolution graphics, with the result that displays can look quite ridiculous at

times. A straightforward PRINT CHR\$(8) solves this problem and PRINT CHR\$(9) gets us back to normal.

It's often possible to enter a number into a program when the program really wants a string, or *vice versa*. Fig 2 is a menu selector, and only allows the user to press the right keys.

**Menu selection:** this, like our earlier input routine, is a general purpose program that can easily be adapted for individual needs. Basically, it prints a set of options and waits for a key to be pressed. If the right key is not pressed,

*'Sorting out the minor program problems before encountering the major ones will give them a degree of authority and professionalism.'*

nothing happens; but if it is, control passes to the required part of the program before returning to the menu.

**Explanation:** Lines 20-100 print up a list of menu options (not very exciting I know, but it suits our purposes). Line 120 prints up a simple message, while line 130 transfers program execution to

the subroutine starting at line 2000, which checks for the key press.

The keyboard buffer is cleared by line 2000 to prevent keystrokes being stored up. Line 2001 is a simple GET statement. In line 2002, if the 'Q' key is pressed the 'QUIT' option has been selected, so the program ends. Line 2004 checks on the ASCII value of the key being pressed. If this is less than 49 or greater than 57, the key pressed was not a numeric in the range one to nine, so ignore it and wait until a suitable proper key is pressed.

Using the ON ... GOTO command, line 2006 scales down the ASCII value until it falls into the range one to eight, and goes to the required part of the program. Lines 3000-10000 are brief routines to inform the user which option has been selected. Of course, in your own programs this instruction would be more extensive.

## Conclusion

Sorting out the minor program problems before encountering the major ones will not only make the writing of programs easier, but it will give them a degree of authority and professionalism.

The programs presented here are specifically for the Commodore 64, but can be transferred to other machines as required. **END**

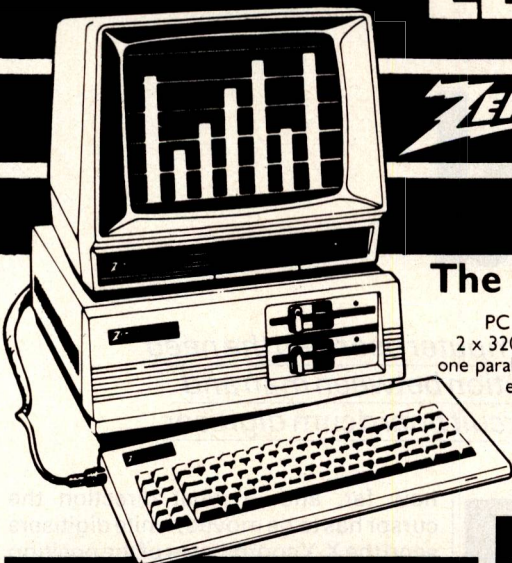
```
4 PRINTCHR$(8)
5 REM INHIBIT CBM LOGO AND SHIFT KEY ACTION
6 POKE53280.0:POKE53281.0:PRINT"[CLR.YEL]":POKE53272.23
7 REM BLACK BORDER. BLACK BACKGROUND AND UPPER/LOWER CASE
10 REM START OF MENU
20 PRINT"OPTION ONE : PRESS '1'"
30 PRINT"OPTION TWO : PRESS '2'"
40 PRINT"OPTION THREE : PRESS '3'"
50 PRINT"OPTION FOUR : PRESS '4'"
60 PRINT"OPTION FIVE : PRESS '5'"
70 PRINT"OPTION SIX : PRESS '6'"
80 PRINT"OPTION SEVEN : PRESS '7'"
90 PRINT"OPTION EIGHT : PRESS '8'"
100 PRINT"TO QUIT : PRESS 'Q'"
120 PRINT:PRINT"PRESS ANY KEY FOR MENU OPTION."
130 GOSUB2000
135 FORI=1TO1000:NEXT
140 GOTO6
1995 REM *****
1996 REM * MENU SELECTION *
1997 REM * *
1998 REM * PCW 1984 *
1999 REM *****
2000 FORI=1TO10:GETA$:NEXT
2001 GETA$: IFA$="" THEN2001
2002 IFA$="Q" THENPRINT"[CLR]BYE.":END
2004 Z=ASC(A$): IFZ<49ORZ>57 THEN2000
2006 ONZ-48GOTO3000,4000,5000,6000,7000,8000,9000,10000
3000 PRINT"OPTION ONE SELECTED":RETURN
4000 PRINT"OPTION TWO SELECTED":RETURN
5000 PRINT"OPTION THREE SELECTED":RETURN
6000 PRINT"OPTION FOUR SELECTED":RETURN
7000 PRINT"OPTION FIVE SELECTED":RETURN
8000 PRINT"OPTION SIX SELECTED":RETURN
9000 PRINT"OPTION SEVEN SELECTED":RETURN
10000 PRINT"OPTION EIGHT SELECTED":RETURN
```

READY.

Fig 2 Menu selection



# IN MICROSYSTEMS ONE NAME LEADS THE REST...VSI



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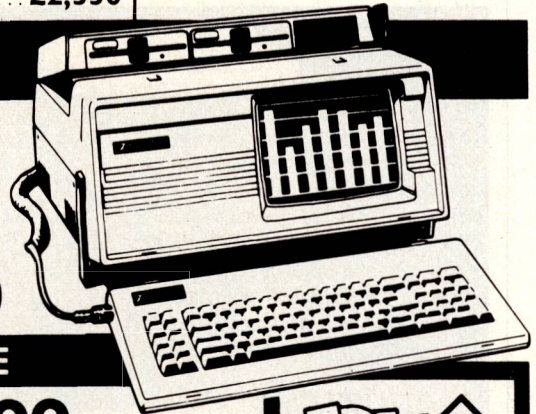
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| Commodore access cable     |             | Apple III access cable |             |
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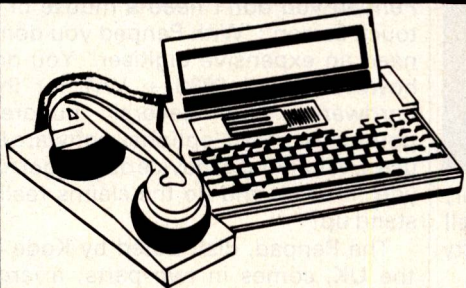
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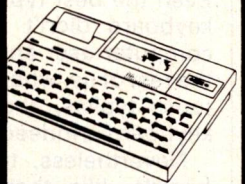
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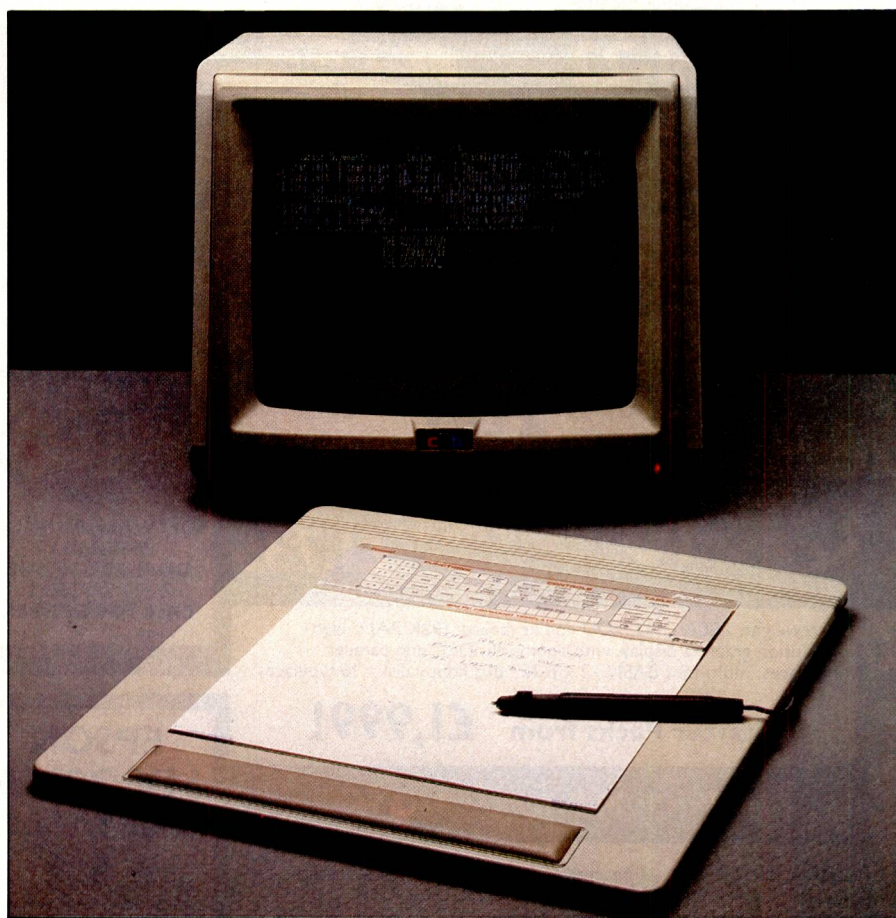
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# Penpad

*Keyboard mastery has apparently evaded many computer users, so the need has arisen for alternative methods of communication between man and machine. Gareth Jefferson considers Penpad, a circuit board cum digitiser tablet for the IBM PC.*



Even the best typist must wish that a keyboard didn't stand between the computer user and the computer. For the rest of us, who are less than perfect touch-typists, the standard qwerty keyboard is indeed a real barrier.

Nevertheless, typewriter-style keyboards, like them or not, are the standard man-machine interface as far as data input goes, but their deficiencies have not gone unnoticed and numerous attempts at improvement have been made. The Dvorak keyboard, said to be more 'ergonomic', emerged many years ago; court stenographers have been transcribing proceedings at dictation speed on stenographs; Denis

Norden has been using his Microwriter; and a plague of mice has broken out all over the civilised world, but the qwerty keyboard reigns supreme.

However, it has to be admitted that there are some things ordinary keyboards do not do well. They are not particularly convenient for moving cursors about the screen, and are quite hopeless for the direct input of graphics.

## Alternative devices

Two classes of device have grown up to overcome these problems — mice and digitisers.

Mice work by telling the computer

how far, and in what direction the cursor has to be moved, while digitisers send the X-Y coordinates of the position on a tablet of a stylus or transparent plastic cursor. Mice are ideal for rapidly moving the cursor around the screen, and, to a slightly more limited extent, for inputting graphics. Digitisers are ideal as graphics input devices: they give absolute positional data and generally offer high or very high resolution — at a price.

Pencept Inc of Waltham, Massachusetts offers IBM PC users 'a new and better way to learn and use your PC' thanks to the Penpad, a digitiser that, according to the manual, 'does the work of various specialised computer devices: a typewriter keyboard, a mouse, a touch screen and a digitiser'.

The manual goes on: 'Penpad is very easy to use, because Penpad allows you to work with a pen and paper — just the way you are used to working.'

The claims made for Penpad are impressive: 'With Penpad you don't need a keyboard'; 'With Penpad you don't need special function keys'; 'With Penpad you don't need a mouse or a touch screen'; 'With Penpad you don't need an expensive digitiser.' You do, however, need £830 + VAT for the hardware, and several hundred pounds' worth of 'optional' software to use it. What kind of device do you get for your money, and do the claims really stand up?

The Penpad, distributed by Kode in the UK, comes in two parts: a large circuit board that plugs into a vacant IBM slot, and a digitiser tablet with attached pen. The circuit board is an impressive device in its own right, and has more computing power than many desk-top computers. The heart of the system is a Motorola 68000 supported by 128k of ROM (in 27128 EPROMs) and 64k of RAM. Communication between the board and the tablet, and between the board and the PC, is via two Z80 DARTs (the Z80 DART is a chopped-down SIO that only supports asynchro-



nous communications). The need for this considerable processing power will become apparent when we look at what the Penpad is capable of doing.

The tablet itself is a slim plastic-encased board with an 11in × 11in writing surface, and an area at the top which takes templates. The tablet connects to the PC's circuit board via a cable and a miniature 15-pin D connector. The stylus, which is about the size of a fountain pen, has a built-in ball pen and is connected by a thin cable to a socket at the rear of the tablet. Like most digitisers, it works by transmitting high frequency magnetic pulses which are detected by a coil in the tip of the stylus.

As the blurb suggests, one way of using Penpad is to replace the keyboard and allow handwritten characters to be entered via the tablet, rather than by means of the keyboard in the usual way. Once the PC has been booted up and the standard software loaded, Penpad will function in character recognition mode in parallel with the keyboard. Characters written in the writing area of the tablet, provided they are tolerably well formed, are recognised and transmitted as ordinary ASCII codes. All characters must be written in upper case style, but lower case characters will be transmitted if the letters are written half height.

Portions of the tablet can also be defined as a 'command template', meaning that areas of the tablet will transmit specified character strings when touched by the stylus. In default mode, the top of the tablet is configured to emulate the IBM's non-character keys (function keys, ALT, CTL, backspace, cursor keys, ENTER, and so on). Utilities are available to allow customised templates to be created, and several predefined templates are available for popular applications software such as Lotus 1-2-3 and the IBM Personal Editor.

Penpad can be used in digitiser mode. Unlike the mouse mode, which transmits cursor codes, the digitiser mode bypasses all forms of character recognition and processing. It transmits the X-Y coordinates of the pen position at rates of up to 100 points per second, and with a resolution of up to 200 points per inch. These coordinates can then be processed by the computer entirely under software control. At this digitising speed, and with this degree of resolution, Penpad in digitiser mode should be ideal for medium resolution graphics input in applications such as low-level CAD. It could also be used for the input of Chinese and Japanese characters, notoriously difficult to handle using an ordinary keyboard. Unfortunately, software does not yet exist capable of recognising such complex symbols — not surprising when you consider the processing power needed for just a handful of alpha-numerics.

To get full benefit from the Penpad you need more than the basic utilities

provided when you purchase the tablet.

Pendraw, available for an extra £165 + VAT, allows simple graphics to be entered and saved on disk with ease. Shapes can be entered onscreen either freehand, or as lines, ellipses or rectangles (by specifying end points or height and width). Other commands, all, incidentally, issued by touching command panels on the command template, include FILL, ERASE, MOVE and COPY. Screens can be saved onto or loaded from disk, and two screens can be held in memory at a time, swappable at a touch of pen to panel. One background and three foreground colours may be used at a time. Text may be added anywhere to the picture by switching to text mode. A useful UNDO function allows second thoughts, and SAVE will save the picture to a named file.

Another software option, Penform, also costs £165. This allows customised forms to be created to your own specifications, although getting these to work with existing applications software is no trivial task for the inexperienced programmer, unless the form is only going to send ASCII codes and strings already recognised by the program. Penform is a powerful piece of software that is comparatively straightforward to use, first by creating a blank form and then by defining the fields within it. At a form's creation stage, some quite sophisticated data entry error checking can be built in by specifying allowable data types — rather in the way some databases allow only specified types of data to be entered in specific fields.

Allowable data types are: upper case alphabetic, upper case alphanumeric, numeric, check boxes, 'other' (user specifiable), and date and time. Field types can also be specified: data (for normal entries), fill (to hold pre-defined

keys or joysticks hands down. Try as I might, though, I really couldn't think of any use for the graphics that Pendraw allows you to create — creating logos to go with your programs, perhaps?

As a means of creating and using custom-designed forms and templates, Penpad might be able to justify its cost in a few hypothetical situations. It's certainly easier to jab a pen at a box labelled RETRIEVE than to type the same word in at a keyboard, or to tick a box labelled NEW MEMBER rather than get the same effect on a keyboard. One suggestion is that Penpad would be useful used like this in a warehouse for inventory control, where ham-fisted workers might find a conventional keyboard beyond their powers of concentration or the keys too small for their sausage-like fingers. I find this rather implausible. Better, surely, to train people to use keyboards and have done with it. Keyboard mastery is said to be a marketable skill these days, too!

As for the claim that Penpad does away with the keyboard for text entry, it is frankly laughable. Penpad's character recognition mode puts me in mind of wicked Dr Johnson's comment on women preaching: '... like a dog walking on his hinder legs. It is not done well; but you are surprised to find it done at all.' The surprising thing is that Penpad can indeed recognise handwritten letters, provided, that is, you remember to put tops and tails on letter l's and to cross zeros. You also have to keep your eye on the screen at all times. Penpad frequently fails to recognise even carefully formed characters, and seems to find special difficulty with the slash (/), double quotes ("), round brackets and square brackets. If you are a one-finger typist and think that handwritten text entry would be a godsend worth upwards of a thousand pounds, ask the dealer to let you write in

---

*'As a digitiser it offers medium resolution and high speed — both more than adequate for the IBM's capabilities at a price comparable with other digitisers of similar performance. It would be ideal for CAD applications capable of being run on an IBM PC.'*

---

data), and required (for fields with mandatory input).

### Usability

There is no doubt that the Penpad is an impressive combination of hardware and software. In mouse mode it works at least as well as a conventional mouse, albeit at a price that would buy a whole nest of mice. As a digitiser it offers medium resolution and high speed — both more than adequate for the IBM's capabilities at a price comparable with other digitisers of similar performance. It would be ideal for CAD applications capable of being run on an IBM.

As a graphics input device it works with incredible ease, and beats cursor

DIR B:W. Watch the screen and if you don't get D1R B1C? or similar after five seconds, Penpad may be for you.

### Conclusion

If all you need is a mouse to quickly move the cursor around the screen, then a mouse would be a far better buy.

To justify the cost of the Penpad you either have to have a pressing need for a well engineered digitiser, or be using applications software where the keyboard really gets in the way.

If the applications involve more than a minimum of text entry (and what application doesn't?), even the most inept typist will quickly find the keyboard faster, more accurate and much cheaper. **END**





# Portman modem

*Interlekt, long-standing supplier of professional data communications equipment, has advanced its range with the Portman, a multi-standard modem with BABT approval. Peter Tootill tests the line and reports.*

There are now a number of multi-standard modems appearing on the British market. The main advantage these have over the old single-standard types is that one modem gives you access to several different facilities: for example, CCITT V.21 for bulletin boards and many online systems, and V.23 for Prestel.

The Interlekt Portman is a V.21/V.23 modem with built-in, auto-answer capability. It's also one of the first multi-standard modems to be approved by the BABT (British Approvals Board Telecommunications) — use of un-approved modems is illegal. Interlekt is an established modem manufacturer and has been supplying

data communications equipment to the professional DP market for about six years. As well as modems, its range of products includes data analysers, local area networks, sophisticated diagnostic equipment for communications applications, and data scramblers.

The Portman costs £195 + VAT and carriage, making a total of around £230. This price excludes an RS232 cable, but includes a cable to connect it to a telephone point, a mains cable and 13 amp plug (you'll need a two-way adaptor if you're using one of the new-style telephone sockets). There are still problems involved in supplying a modem with a telephone socket on the back, so the obvious method of

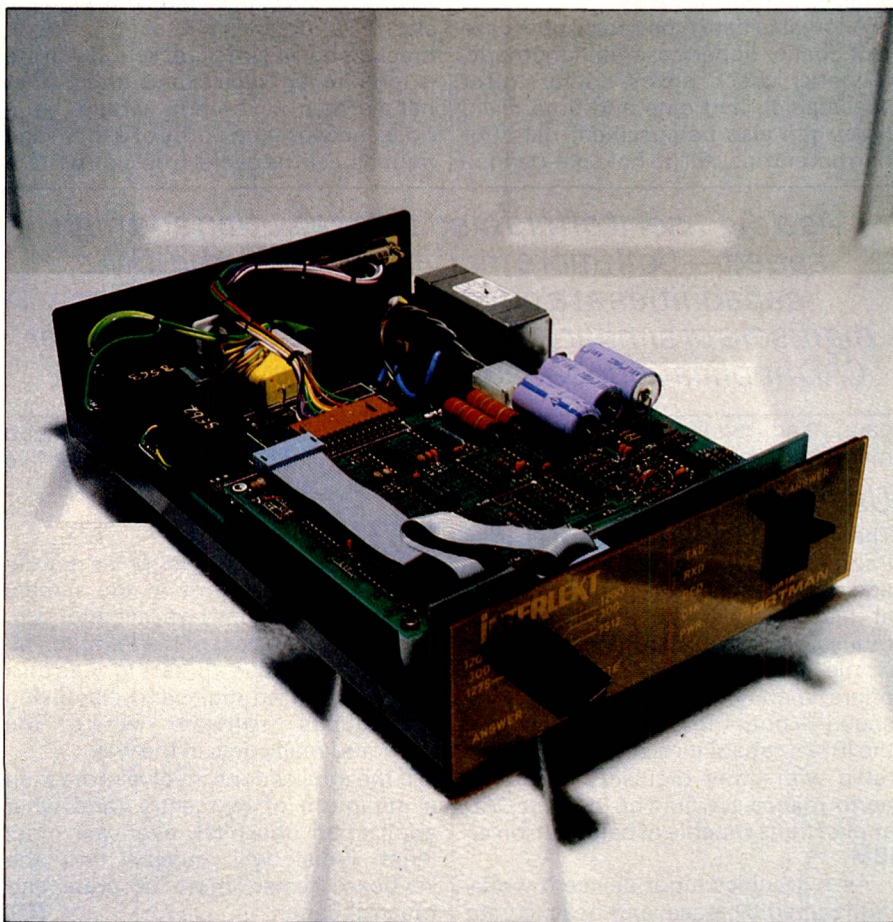
plugging the modem into the telephone socket and the telephone into the back of the modem is not possible. The reason for this is that the new British Telecom telephone sockets are considered *unsafe*, and any equipment incorporating one causes problems with the BABT approvals procedure. Apparently the rules are being changed to make the sockets safe (I would have thought that the *sockets* would have to be changed to make them safe — obviously I've missed a point somewhere!).

## First impressions

The Portman arrived well packed in several layers of 'bubble plastic' packing material in a cardboard box inside more layers of bubble packing. It is, however, solidly built in a metal case and should stand a bit of rough handling. The case is painted orange and the front panel is brown. At 6.5in x 10.5in x 2.5in it's large enough to stand a telephone on, which means that it needn't take up any extra space on your desk. The modem weighs 3.6lbs.

The front panel carries two switches and a column of indicator LEDs. The left-hand switch is a six-position rotary type and selects the relevant operating standard: the Portman provides 1200 half duplex, 300 full duplex and 1200/75 asymmetric duplex speed. On the right is the manual/auto-answer toggle switch which has two normal positions and a third 'momentary' contact position; it also carries a green LED to show that the modem is connected to the phone line. This LED is labelled 'data' which is rather misleading as it doesn't indicate the presence of data on the line. This is done by two of the other (red) indicator LEDs. This bank of lights is for 'power', 'data terminal ready' (DTR), 'carrier detect' (DED), and received and transmitted data.

The rear panel carries a standard 25-way (DB-25) RS232 connector, a mains fuse, the mains and telephone connecting cables and an earth tag. The instructions say: 'You are required to





connect the tag marked "Hard wire to protective earth" to a suitable earth.' They don't tell you what a 'suitable earth' is. The reason for the earth is to 'prevent hazardous voltages from passing across the telephone line interface when the Portman is not plugged into the mains.' I suspect that these notes are included to satisfy BABT requirements.

The RS232 socket provides a generous selection of control lines (Fig 1) which should be sufficient for all normal purposes. The use of a standard DB-25 socket is welcome: many systems (micros and modems) have been recently appearing with non-standard sockets which can lead to problems when connecting to them.

## Inside

Internally the modem is neatly laid out and uses good quality PCBs. There are three of these: the main PCB, the auto-answer PCB and the PCB that carries the front panel controls. Intriguingly there are a number of empty spaces on the main board that are marked for relays and capacitors. These apparently are used in the IDC30, which is a bare board version of the modem designed for OEMs to incorporate in their own equipment. This can be supplied in several versions including auto-dial, with TTL rather than RS232 level outputs, and with software speed selection.

Interlekt is also working on a version of the Portman which will enable micros that cannot handle split baud rates to use Prestel. This will work by buffering the 75 bits/sec line, and allowing the micro to work at 1200 bits/sec full duplex. It is also working on a synchronous adaptor which will allow the modem to be used with high-level protocols such as IBM 2780.

The Portman uses the ubiquitous AM7910 'world standard' modem chip and, although this can provide Bell (US) frequencies as well as CCITT, modems using this feature cannot obtain BABT approval. Interlekt will be producing an export version that will provide both Bell and CCITT frequencies, but this will not be BABT-approved.

## In use

The modem is generally straightforward to use. In originate mode you simply dial the number you require and, when you hear the modem tone at the other end, press the toggle switch down and release it. This connects the modem to the line; pressing once again will release the line. One thing not stated in the manual is that the DTR control line must be turned on (that is, taken to at least +3 volts) or pushing the switch down will not connect the modem to the line. If no connection is made to the DTR pin (pin 20 on the RS232 connector) it floats high, but if your micro or terminal does connect to this line it will have to turn it on before you use the modem. In

| Pin | Signal | Name                        | CCITT No |
|-----|--------|-----------------------------|----------|
| 1   | PGND   | Protective ground (chassis) | 101      |
| 2   | TD     | Transmitted data            | 103      |
| 3   | RD     | Received data               | 104      |
| 4   | RTS    | Ready to send               | 105      |
| 5   | CTS    | Clear to send               | 106      |
| 6   | DSR    | Data set ready              | 107      |
| 7   | SGND   | Signal ground               | 102      |
| 8   | CD     | Carrier detect              | 109      |
| 9   | +8v    | } test voltages             | -        |
| 10  | -8v    |                             | -        |
| 20  | DTR    | Data terminal ready         | 108/2    |
| 22  | RI     | Ring indicator              | 125      |

Fig 1 Portman RS232 connections

most cases it will do so without any further action on your part, so you won't normally have any problems.

In manual answer mode the modem presents no difficulties. You use one switch to set the operating standard and the other to switch the modem on or off line. Auto-answer also gave no problems despite the manual's vagueness. I originally wasn't sure whether the RI method of auto-answering was supported and, as my BBS software is set up to use this method, I wondered if I would have to reconfigure it to use the Portman on my system. In fact, all I did was plug the modem into the telephone socket line at one end (using a two-way adaptor), and plug the RS232 cable from the computer into the socket on the modem (no problems with non-standard sockets here). I then set the rotary switch to '300 answer', pushed the toggle switch to auto-answer, and sat back and waited. Within a few moments the next caller had rung in and the modem behaved beautifully. I left it working for a few days continuously and there was no sign of over-heating, or any unusual problems with data corruption or lost carriers. The Portman also dropped the line cleanly if no carrier was detected, and at the end of a call.

The modem worked perfectly at the other speeds too, and I liked the generous provision of LEDs on the front panel. 'Power', 'online' and 'carrier' are common, but the 'DTR', 'transmit' and 'receive data' are less common. They make it much easier to work out what is going on should you have any problems.

One absent feature is a test mode in which the modem, when offline, echoes back data to the terminal as you type at the keyboard. This, also, is a very useful feature when setting up or trying to work out what has gone wrong if things are not going according to plan.

## Documentation

This gives useful basic information about connecting up and using the modem. It's generally adequate, although the section on using the modem in 'auto-answer' mode (that is, to answer the telephone automatically without any human intervention) is a little superficial. It doesn't, for example, discuss the two main methods of

auto-answer. These are:

a) where the modem answers the phone as soon as it rings and informs the computer when it gets a carrier; and b) where the modem tells the computer that the phone is ringing (using the ring indicator (RI) line), and lets the computer decide whether or not to answer it.

The Portman supports both methods of auto-answer depending on whether DTR is already set high on receipt of a call. The manual doesn't make any reference to this, but in fairness most users will just plug it in and it should work without any problem. Method (b) is useful if you want to implement a 'ring back' system, or to have the modem answer calls during certain hours only. A little more explanation of how the auto-answer system works would be helpful to those wanting to do the slightly more unusual things.

The last page of the manual contains a service registration card (there's a two year 'return to factory' warranty on the modem), and a card to send to British Telecom to tell it that you're going to be using the modem and, optionally, to ask it to install a socket.

Interlekt has a national service organisation and can offer a post warranty service agreement.

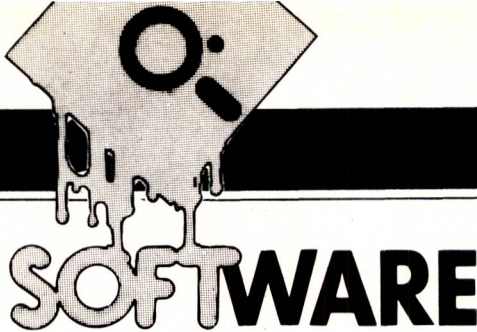
The manual provides no information about accessing the other transmission modes that the chip is capable of, such as Bell 103 or CCITT V.23 600 bits/sec mode. It just says that these other modes can be 'supplied on request'. Indeed it stresses that 'there are no user-accessible controls inside the Portman', and 'interference with internal components will invalidate the warranty.'

## Conclusion

The Portman is a well made and ergonomic modem. Its only drawbacks are the price, which is higher than some competitors, and the lack of an auto-dial function. The latter won't worry many people and there aren't many other BABT-approved modems around that offer auto-answer facilities. The manual would have been greatly improved by the addition of a 'technical' section, but should be perfectly adequate for the majority of users. **END**

*All enquiries to Interlekt Electronics Ltd, Interlekt House, 24 Portman Road, Reading RG3 1LU. Tel: (0734) 589551.*





# A different aspect

*Kathy Lang views Aspect, a multi-file data management system with a macro generator, aimed at those requiring a powerful package which can be tailored for the naïve user.*

Anyone looking for a data management system will find that an increasingly large proportion of those on the market contain many powerful features, which will be used mainly by experienced users who are setting up systems for novices. Presumably this is a reflection of the increased power of the larger micro systems now available, especially the increasing popularity of hard disk systems. It also reflects the growing number of large companies who are buying micro systems by the score for implementation in user departments by experienced data processing staff. Microft Technology's Aspect falls clearly into this category.

Aspect is a multi-file system: that is, it permits several data files of different structures to be related to each other and processed together. The package provides two kinds of relationship: a close-knit link in which records of several different formats may be stored together in a single logical file, and a looser linking of separate files. Individual sets of records, called levels, must have the same structure, but each field within a record occupies only the space needed for the currently stored value. This makes the package economical in file storage for applications containing a lot of varying information, including small amounts of running text.

Aspect is at heart a command-driven package, operated by issuing commands constructed by the user. However, a number of features are provided to help in the construction of commands.

An experienced user can set up menus of macros, which are, in essence, collections of commands for carrying out a particular task. These menus can then be used by the less experienced. Aspect provides a macro generator for creating the most frequently needed types of macro; the generator takes you through each step of macro construction using a combination of menus and question-and-answer techniques to ensure that nothing is forgotten.

Alternatively, most commands

(those which do not require the specification of a full-screen display layout) can be used directly, and macros can be directly activated through the 'DO macroname' command. (Macros are very similar to Basic programs with line numbers, while directly enacted commands parallel Basic's Immediate mode.) A particularly attractive feature is that Aspect macros are compiled rather than interpreted (most data management systems with pseudo-programming features interpret their commands), which makes the system relatively fast.

When Aspect is run, the user is asked to enter a password and the date; the main menu is then displayed (Fig 1). If a special menu (which must be called MAINMENU) has been set up for your use, pressing RETURN activates it (1 is the default option on the system menu), and thereafter you are given whatever features the special menu provides.

## Constraints

Fig 2 shows the main constraints and features of Aspect. The limit on record size is unusually large, but within it is a limit of 500 characters on each 'level' of the record. Where each record contains only a single level, the 500-character limit applies to the whole record. This will not be a problem in most applications, where the information is truly structured — indeed, the 'level' approach can be very helpful in a good many business applications.

For example, suppose you wish to store customer records which include a name and address (one per customer), invoices (many per customer), and

items in invoices (several per invoice). In Aspect, you would define a three-level record, the first level containing the name and address, the second the invoices, and the third the individual items on each invoice. The stipulation which Aspect makes is that each record should be uniquely identifiable by its own key, together with that of the level above it. This means that each invoice for a single customer must have a different invoice identifier, and each item on a single invoice must have a different item identifier.

Where this kind of structured approach is appropriate, it can help to ensure that logical errors do not occur in the data. (Those familiar with relational terminology will recognise the enforcement of second normal form.) The limit of 500 characters will be unimportant, as you can extend this by creating lower levels. However, there are circumstances — notably those where a substantial amount of running text is involved (for example, library catalogues and consultation records) — in which this limit will be highly inconvenient.

Aspect provides the usual data types — numeric, character and date, which may be displayed and entered in a variety of formats, plus a 'multiple value field' format which can be very useful in fields like addresses. This format allows you to have a single generic name for a field which covers several occurrences with the same specification, yet also allows you to refer to the individual occurrences by name. A four-line address can be described with a single name, but you can still refer to each line when setting up the printing of address labels. This feature, coupled with the fact that Aspect does not reserve space for data when fields are empty, means that it would be suitable for applications where much of the data was grouped, the size of each group being variable. An example might be personnel records in a recruitment agency: each person recorded may speak: no

ASPECT Control Menu  
1 Call in MAINMENU  
2 Direct Commands  
3 Notepad and Macro Display  
4 Macro Design and Maintenance  
5 File Maintenance  
Type in selection number [1]  
Press ESCape for Help  
Fig 1 Main menu



|                                     |                                                  |
|-------------------------------------|--------------------------------------------------|
| Maximum filesize                    | OSL                                              |
| Max record size                     | 3500ch<br>(500/level)                            |
| Max no fields                       | 150+                                             |
| Max field size                      | 120 at present                                   |
| Max digits                          | 30                                               |
| Max prime key length                | 120                                              |
| Special disk format?                | No                                               |
| File size fixed?                    | No                                               |
| Link to ASCII files?                | Yes                                              |
| Data types                          | C,N,D,Ref                                        |
| Fixed rec structure?                | Yes                                              |
| Fixed record length stored?         | No                                               |
| Amend rec structure?                | Add field-change<br>MAP, otherwise<br>by copying |
| Link data files?                    | Yes                                              |
| No data files open                  | 12+                                              |
| No sort fields                      | 49                                               |
| No keys                             | 1 per level                                      |
| Max key length (chars, fields)      | 120, 6+                                          |
| Subsidiary indexes kept up-to-date? | NA                                               |
| Data validation                     | Good                                             |
| Screen formatting                   | Row/col<br>co-ordinate                           |
| Unique keys                         | Mandatory                                        |
| Report formatting                   | Default, row/col<br>coordinates                  |
| Store calculated data               | Yes                                              |
| Totals & statistics                 | Yes                                              |
| Store selection criteria            | Permitted                                        |
| Combining criteria                  | And, Or, Not                                     |
| >1 criterion/field?                 | Yes                                              |
| Wild code selection?                | String within                                    |
| Browsing methods                    | Primary key                                      |
| Interaction methods                 | Menus,<br>commands, full<br>tailoring            |
| Reference manual (max 5*)           | **                                               |
| Tutorial guide+ (max 5*)            | None                                             |
| Reference Card+ (max 5*)            | None                                             |
| Online Help+ (max 5*)               | **                                               |
| Hot-line?                           | Free at present                                  |

Notes: + memory dependent—these figures apply to systems with 128k memory

Fig 2 Features and constraints

foreign languages, French, French/German, Swahili, Serbo-Croat; Aspect provides a convenient and economical way of storing such fields.

## File creation

The first step in setting up an Aspect datafile is to create a MAP macro, which

is simply a set of definitions of each field in the file. Each level in the file has a name, and a key consisting of one or more fields used to identify the record within its level. Aspect requires keys to be unique, so each top-level record, and each record in a single-level file, must have a unique key. No other direct access to records is provided; if you want to retrieve records by specifying values of other fields, you must read the file sequentially.

Once the file definition has been created, you must ask Aspect to create an empty file using that specification. Finally, you must create an INPUT macro, which contains the rules for taking information from the keyboard and storing it in the data file or files. This involves a definition statement for every field, plus various items such as the calculation to be carried out before a field is stored, and whether the field is mandatory. Considerable flexibility in prompting is provided, so that you can specify messages for the operator, their position on the screen, and actions to be taken depending on the value of the operator's responses. You can also specify Help text, to accompany as many fields as you wish, by entering a question mark at the start of the field position.

Aspect allows you to have several INPUT macros for a single data file, and you don't need to include all fields each time. For a personnel record file which contains details of salaries, it's possible to set up an INPUT macro, which does not include the salary field, to enable clerks to amend the records without access to confidential information. You must specify the position each required field is to occupy using row and column coordinates, rather than the more common 'paint-a-screen' method which is usually easier to use. Aspect does not give any indication how the display will look when these coordinates are used—you have to execute the macro to see how your format has worked in practice.

## Data input and updating

All data entry from the keyboard is done via an INPUT macro. This must include the key fields necessary to identify the records to be updated; ASPECT allows you to retrieve records for updating only through specification of key fields' values. If you enter a key value which is not in the file, it is assumed that you wish to create a new record. Where there are several key fields, you must specify the value of each exactly; access to lower levels is possible only through the higher. However, by using a feature called 'position control', you can access records in key sequence without specifying the key each time, and you can move between levels.

Data validation is excellent: fields can be checked for accuracy and conformation to particular patterns; updating of fixed fields such as account numbers can be prohibited, and so on.

Records can also be updated in a batch. The features provided are identical with those for extracting subsets of information, and include sorting and calculation. The difference is that records are replaced, rather than copied to a different file. For numeric fields, you can choose whether the result of a calculation is to replace a field value or be added to it.

If you wish to provide facilities for file reading only, you can use the VIEW macro. This works in almost the same way as the INPUT macro, except that you are not permitted to make changes to the record. The other major difference is that you don't have to specify exact keys to start browsing: the 'position control' feature allows you to specify an incomplete key. You will get an error message, but the record pointer will nevertheless be positioned at the start of the first relevant record, and you can then browse through. For example, if you type 'SM' into a five-character key field, you'll be able to browse through all records for which that key begins with the letters SM.

In addition to the display of individual records (one per screen), you can use the REPORT command, either directly or in a macro, to compose lists of summaries of records for display only. These features are identical to those provided for printed reports, and the choice of screen, printer or both for showing reports is governed by a single system switch which can be reset at any time.

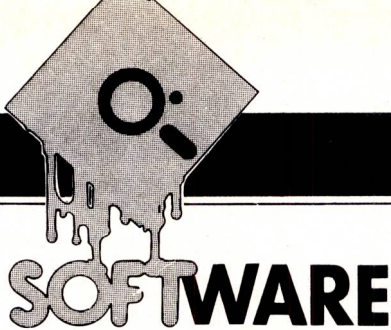
Aspect's standard reporting format, unless you specify something more sophisticated, is one row per record, with each field shown across the report in a column with width equal to the maximum size of the field. Using this format, you can limit the fields reported on, and also select particular records. This facility can be used either as a direct command or in a macro. A simple form of the command, used to carry out Benchmark four, follows:

```
REPORT FILE PCWTEST SELECT WHEN
TYPE EQ "DAL" GIVE LIST OF REFNUM
END
```

This command will cause Aspect to select all the records in which the field Type contains the characters DAL, and list the value of the field Refnum for those records; this list can be printed, or appear on the screen. When displaying reports, you can choose to pause every 20 records to have a look at the results. You can produce a summary, showing totals and sub-totals if appropriate, just by changing the parameter LIST or SUMMARY in the example above. It's also possible to set up sets of instructions to be actioned each time a record is read or as each line is printed; for example, to perform intermediate calculations.

More sophisticated layout can be provided by setting output options. These permit you to change the amount of space a field occupies and the spaces between fields, spread each record





over several lines, print headers and footers on each page, and so on. You can also request several levels of subtotalling, and specify a page change when any or all of the subtotal level criteria change. Calculations can be performed on subtotals and totals; for example, to permit the display of percentages. The reporting facilities can also be used on external files which use any of the formats Aspect can read.

When selecting records for editing on the screen, you are limited to using key field values. For retrieving records for reports, whether for display on the screen or printing, when writing sets of records to other files (of Aspect format or one of the external formats), or when updating as a batch process, the facilities are much more flexible. Three types of selection are provided: you can select only those records which match records in another file; select records which match a range of values from a single key field; or select records matching a set of criteria using the WHEN option. This option can test any field, and allows you to test with the usual range of comparison operators (=, <, >, and so on, all in conjunction with NOT to reverse their meaning), plus a substring operator which allows you to find characters in a particular position or anywhere in the field. Comparisons may involve field values, constants or expressions; tests may be connected with AND or OR in any combination within a selection, and brackets may be used to force a particular order of evaluation.

When retrieving records for interactive amendment, they appear in key field order. For reporting, whether to the screen, printer or a file, records may be sorted in order by any field or combination of fields in ascending order, using a parameter to the REPORT command. The same options apply when extracting subsets of information with the EXTRACT command.

Calculations may be performed on fields from files, or on memory variables. These must first be defined to give their name, size and type. Calculations may use the normal arithmetic operators, plus a range of functions such as ABS, INT, LOG, and the basic trigonometric functions. Strings may be concatenated together, and new strings created by using the EDIT operator.

## Multiple files

Two file linkage methods are provided. A tight link is given through the Level provisions which allow you to specify several different levels in a single logical file, with each level having a different structure. In fact, each level is stored in a separate physical file to ease data retrieval, and to make it easier to be economical with storage, but this need

not concern the user.

The number of levels you can have depends on the memory available — the minimum is six, while on a 256k Sirius, 12 are permitted. Since each level is accessed through the level above it via a unique key, the relationship between the different sets of records is predefined. Individual files with their own MAPs may be linked to one another in ways that are not predefined, but are specified through the LINK option in the INPUT and REPORT commands. The use of levels constrains you to a particular structure, but gives protection against storing invalid data. The LINK mechanism, on the other hand, gives greater flexibility, but puts more onus on the user to check the accuracy and integrity of the information and data relationships.

File housekeeping facilities allow you to delete, copy and rename files and macros, and display directories.

## Tailoring

There is a sense in which all Aspect applications are tailored to individual requirements, since some essential functions can only be carried out through stored macros. For example, the INPUT command is only normally used in a macro. Macros have some of the features of programs, and some distinct differences. The main difference is that most macros are essentially procedural — they carry out one function, with that function being activated by a single command. However, the range of options available through a command allows you to behave almost as if you were writing programs.

For example, if you wish to produce a report, you would normally construct a REPORT macro containing a REPORT

command. This single command implicitly incorporates the instructions needed to cycle through every record in the file, carry out certain actions in the process, and terminate at end of file. Yet by adding an OPTIONS parameter, you may include processing instructions which are to be acted upon each time a record is read or a line of the report is completed.

The EXTRA option defines temporary storage for the imported records, the OUTPUT option specifies the destination of these records, and the GIVE option specifies the fields to be imported. The SELECT PROCESS option counts each record and displays the result every 20 records (essential when you are monitoring a process that takes well over an hour). You can create memory variables to store temporary results, and the variable COUNTER is an example of this. Temporary variables may be stored in a special NOTEPAD file if required. (Every major command allows you to include provision for error handling.)

The Aspect approach takes a bit of getting used to if you already know something of conventional programming, but it actually relieves the user of the need to bother with a lot of unnecessary housekeeping. For still more flexibility, it's possible to use Aspect in conjunction with the programming language C to gain the advantages of Aspect file handling where it will be valuable, yet retain maximum control.

Once you have constructed a set of macros, you can directly execute them through the DO command, or you can set up a menu so that they are activated just by typing a single digit shown against a description of the option. The complexity of Aspect can be hidden from naive users, while giving them access to the full facilities of the package.

Access to the package is restricted to

## Benchmarks

- BM1 Time to add one new record (Inst)
- BM2 Time to select record by primary key (8secs\*)
- BM3 Time to select record by secondary key (NA)
- BM4 Time to access 20 records from 1000 sequentially on three-character field (6mins 29secs)
- BM5 Time to access record using wild code (8secs\*)
- BM6 Time to index 1000 records on three-character field (NA)
- BM7 Time to sort 1000 records on five-character field (28mins 10secs)
- BM8 Time to calculate on one-field per record and store result in record (54mins 30secs)
- BM9 Time to total three fields over 1000 records (6mins 55secs)
- BM10 Time to add one new field to each of 1000 records (time to change MAP only)

Time to import a file of 1000 records: 1hr 16mins

Notes: NA=Not Applicable — no secondary indexes

\* Time to display full record on screen — retrieval time instantaneous





those knowing the password.

Aspect allows you to import records from ASCII text files in several different formats, including comma-delimited and fixed length records. Importing is as flexible as extracting from data files, and features the ability to select records and fields for importing.

## User image

Aspect is essentially a command-driven package with a reasonable level of prompting, and with a macro generator to help novices construct their own macros. The macro generator works on the basis of a combination of menus and question-and-answer dialogues. This works reasonably well, but in a package with such flexibility it's bound to be a somewhat daunting task for new users. I found it easier to learn a little about the commands for creating and amending macros, and use these directly, rather than going through the generator.

However, this is not to say that all is sweetness and light when using Aspect in direct mode. Certainly those commands which can be used in this mode to operate on data files are reasonably easy to construct, and give you the required results quickly; but the system development commands are less attractive, notably CREATE MACRO and AMEND MACRO. When you enter one of these commands, you are prompted to enter a macro line; this prompt is repeated after each line you type, and takes up a complete line. If you list a few lines of the macro to see what you've got, and add or amend, you lose sight of the listing twice as fast as you would if the prompt didn't take a whole line.

Each line of a macro must have a line number. When adding a line, type the line number and then the line text. You can't request an 'insert mode' and keep entering lines without the prompt line intervening, nor is there any facility to prompt for line numbers. You change a line, type EDIT line number, and are then in an Edit mode very similar to that used in Basic. During editing, the line being changed is shown at the bottom of the screen in reverse video. Furthermore, there is no facility for testing your macro other than running it which involves compilation first, and this lengthens the time needed to test a macro. Clearly the ability to compile a macro is invaluable since it makes execution much quicker, but you should be able to choose a test mode which just interprets; the package should also be able to do a simple syntax check on each statement as it's typed in.

All in all, I found the system development side of Aspect rather unhelpful, although the ability to copy a macro and use it as the basis of a new one is very

useful. In both direct and generator modes, Aspect provides some on-screen help. This is available through the 'interrupt screen', which is accessed throughout by pressing the ESC key.

The interrupt facility allows you to display help text, cancel the current activity, print the previous screen, or change various system parameters (most often the switch between showing reports on the screen, the printer or both). This feature is extremely helpful (it contrasts with the inability of many packages to permit interruption of an activity), and its consistency of use is reflected in other uses of special function keys. For example, on the Sirius, F3 allows you to step back to the previous activity or entry, whatever that may be according to the context. When inputting, F3 takes you back to the previous field entry; when entering information to the macro generator, it returns you to the previous prompt, and so on.

## Documentation

The Aspect manual is a thick A4-size document consisting primarily of reference material. There is a chapter on using the macro generator, which is aimed at helping novices to start using the package, but anyone without pre-

vious computing experience will find this pretty hard going.

There follows a description of the general material relating to all commands, a command summary (which doesn't show the syntax, just the function of each), and a description of each command. Since each command can have several sub-commands, and many of these are common to several commands, commands and sub-commands are listed separately in alphabetical order. If you want to build a complex command, you may need to check half a dozen different places in the manual. This problem would have been avoided to a large extent by the provision of a proper reference summary card showing the full syntax of each command, but including the syntax.

## Conclusion

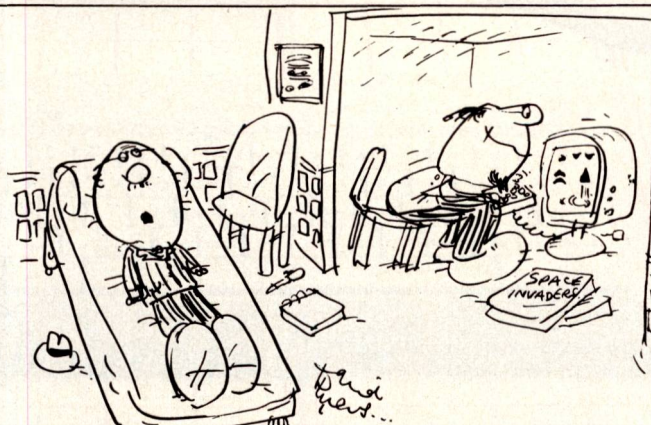
For those who are looking for a package which will give them the ability to tailor complex applications for naive users, Aspect is well worth looking at. It will be most useful to those whose data has a clear structure, of the sort which lends itself to description as a hierarchy of succeeding levels.

Nevertheless, Aspect is a powerful and flexible package, and should provide a useful tool for system developers. If a reference card were provided, and the development tools enhanced, it would be ideal.

END

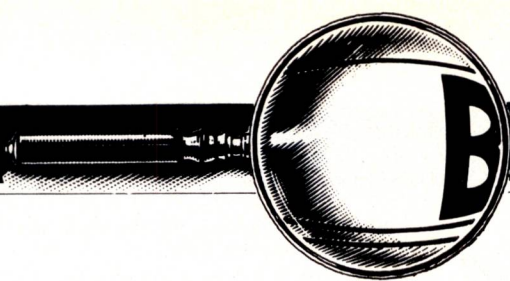
## Summary

|                |                                                                                                                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Package Type   | Database management system with multi-file features used with commands and tailored menus. Powerful system primarily for system developers and thence for novice users using such tailored facilities. |
| Ease of Use    | Good for system designers, if rather tedious at times. Difficult for novices.                                                                                                                          |
| Documentation  | Thorough but terse reference manual, with command description spread wide. No tutorial guide or reference summary.                                                                                     |
| Costs (ex VAT) | £400 (£40 for demo version max 50 records).                                                                                                                                                            |
| Supplier       | Microft Technology Ltd, 45a Radnor Walk, London SW3. Tel (01) 352 7876                                                                                                                                 |



'Sometimes I feel people don't care a jot about me...'





**BENCHTEST**

# Apricot F1

*The Apricot F1 is a compact and inexpensive small system pitched firmly at the £1000 business machine market, and is designed for those who wish to perform certain tasks to a high standard. How will it serve as a replacement for jaded Apples, PETs and Sanyos? Peter Bright tests it out.*





What shall we call the baby? These words must be one of the largest single causes of family arguments, but it's not just happy families who have trouble choosing names for their new offspring. Micro companies spend months agonising over registered trademarks, copyright, and all the other obstacles in the path of common sense.

Take the case of ACT. Most people thought that its new machines would be called 'Rascal'. People inside ACT also thought so, because that's the name printed on the PCBs inside the machines. Then someone discovered that the name had already been registered in Outer Mongolia or some such place, so it kept the Apricot name and called the new machines the Apricot Portable and the Apricot F1.

The Apricot F1 is cast in the same mould as the previous Apricot machine. It offers a true 16-bit 8086 processor, 256k of RAM and is equipped to drive a colour display as standard; all this for £995 plus the cost of the monitor.

## Hardware

The F1 conforms to the traditional three box design — main unit, keyboard and display. The main difference is that it manages to accommodate this in about a third of the space taken by most other systems. All the units are finished in dull cream. It's very much in the same 'transportable' vein as the 'old' Apricot, and can be supplied with a soft carrying bag to tote it around.

The main unit is very narrow but quite deep. Its top is a two stage affair and gets taller halfway back to accommodate the power supply. The front half is flat and is designed to support the monitor.

The front of the main unit houses the disk drives, LEDs for power, caps lock, scroll and disk, and a transparent cover for the infra red receiver. At the back, from left to right, we have RS232 serial port, colour monitor out, composite monitor out, centronics printer port, power in, power out and an on/off switch.

On the right-hand side towards the rear is a system expansion port. ACT is hoping to sell a basic five-slot expansion box to OEMs to plug their own



*Rear view: note the system expansion port*

hardware into. The expansion box is nothing more than an extra F1 case with different front and rear panels, which means that extra hardware can be added and the system will still look trim and neat.

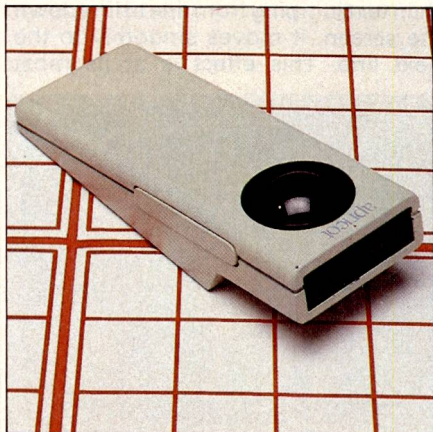
Getting inside the F1 is simplicity itself — just take out two screws, remove the back panel and take the top off. It takes about thirty seconds.

Once you have removed the top, the first thing you notice is that there's shielding everywhere. The power supply is totally encased in its own box,

there's a massive shield over the front of the unit and even the disk drive has heavier than usual shielding.

The main front shield performs two tasks. It reinforces the plastic lid so that the heavy colour monitor can be rested on top, and prevents any unwanted interference from the monitor messing up the electronics.

At the front of the box next to the disk drive are the speaker and decoding circuitry for the infra red receiver. All cooling for the system is achieved by convection — the F1 doesn't use a fan.

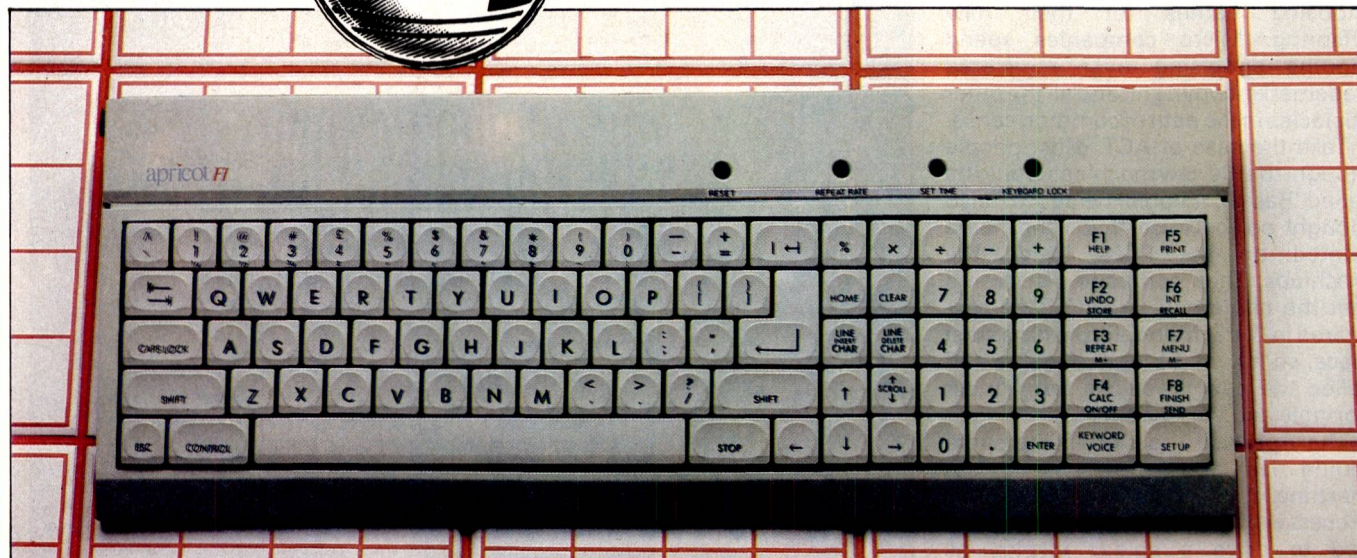


*ACT's mouse/trackerball*



*The main unit is narrow but deep*





*'The keys look just like the pieces in a Scrabble set...'*

The main PCB lies along the bottom of the casing and simply slides out for servicing. In contrast to the rest of the system which was most definitely pre-production, the PCB was very well finished with not a single patch in sight.

Contrary to modern trends there isn't a single custom chip or ULA anywhere; instead extensive use is made of 74LS TTL chips. In the middle of the board is the Intel 8086 which is clocked at 4.77MHz, and next to that are two 16k EPROMs containing the bootstrap and ROM-resident operating system functions. To the right of the EPROMs are two banks of 16 64k RAM chips giving a total of 256k with no parity. In the top left-hand side of the board is a socket for a single Apricot-compatible expansion card.

There are a couple of interesting omissions on the F1's PCB. The first is that there's no socket next to the 8086 for the 8087 maths co-processor. Apparently the demand for the chip isn't high enough to justify the cost of providing the socket.

The second is that there's no DMA chip — the CPU has to fend for itself. Obviously this is mainly a cost consideration: when you are building a thousand pound system something has to go. The lack of DMA shouldn't be

a problem when running under CP/M-86 or MS/DOS, but it could cause problems if the machine was running under Concurrent CP/M and two jobs went for the disk at the same time. ACT doesn't expect too many customers to go for Concurrent on this machine — they would be better off with one of the other Apricots with more memory.

The standard F1 is supplied with a 720k double-sided Sony 3.5in micro-floppy disk drive, which can happily read old single-sided disks. In use the drive performed faultlessly and fast — the new machines no longer have the WordStar speech problem that plagued old machines.

My only reservation about the disk drive is that it tends to overheat. If you left a disk in the drive for any length of time it would be hot to the touch, but while this was disconcerting I didn't have any reliability problems. My second reservation concerns the supply of disks. Plain old single-sided disks have been in short supply for some time, and it looks as if the double-sided disk situation will be worse.

The F1 is supplied with both composite and RGB video outputs as standard. The reasoning behind this seems to be that the skinflints will hang a cheapo composite monitor on the system,

while everyone else will either go for ACT's compact hi-res monochrome Apricot monitor or its new compact colour unit. ACT can also supply a modulator unit which allows the F1 to be plugged into a domestic television.

ACT's new colour monitor is a very impressive piece of kit. It uses a Sony Trinitron tube and electronics to achieve very high clarity combined with compact dimensions. Unfortunately you also have a couple of grand's worth of pre-production hand-carved plastic casing, so I reviewed the system using a Microvitec colour monitor. This looked totally out of place — the rest of the system was neat and compact, and the massive Microvitec looked completely incongruous.

The graphics resolution on the F1 is not as high as the Sirius and Apricot, but it's still a very respectable 640 × 256. In this mode the F1 can display up to four colours out of a palette of 16 onscreen at any one time. Text display is 80 columns by 25 lines. As with all Apricots the fonts are 'soft', and new fonts can easily be called up.

When you switch on the F1, the text on the screen 'smooth scrolls': rather than text jumping from line to line down the screen, it moves smoothly to the next line. This effect is at its most



*The main ACTivity screen*



*The keyboard table editor*



*The character font editor*



impressive when deleting a line in WordStar — instead of the line just disappearing, it appears to slide under the line above.

The smooth scrolling is one application of the F1's system of screen pointers. Instead of directly controlling the screen; programmers can access a system of line pointers to play around with the display. ACT has a nice little demo program that uses the pointers to define windows in which data is scrolled up, down, sideways and rotated, all at high speed. It remains to be seen how many programmers use this feature, as the F1 is the only member of the Apricot family with this ability.

Normally the keyboard is not one of the most interesting aspects of a micro — this is certainly not the case with the F1. The most striking feature of the keyboard is that it doesn't use a cable to connect it to the main unit — ACT has chosen to use an infra red light beam in place of the more usual coiled cable. This is only the second time I've seen this idea implemented on a micro; the first machine to use it was the IBM PC Junior where the light beam was a disaster. The problem was that the signal often got garbled on its way to the main unit. At best this meant that the machine didn't understand your command, at worst it executed a different command.

ACT has overcome this problem by developing its own error detection/correction 'hamming' code. Each letter is transmitted as a 32-bit code. Of that, eight bits are used for type and no less than 12 bits are used for error detection/correction.

This supreme effort certainly paid off in use. While I was testing the machine I tried everything I could think of to fool the system — I bounced the signal off the walls, and used the keyboard way beyond its rated two metre range. Invariably, it either registered the correct key or didn't register at all. It never wrongly interpreted the key.

Having said that, you can't expect to be able to wander around the room typing your life's work and expect the system to pick up everything you type. The keyboard signal is fairly directional; when the machine first arrived, the keyboard would only work if it was directly in front of the main unit. When I looked at the keyboard I found that the infra red LED transmitters were badly aligned, so I bent them back into shape. This improved matters — the keyboard was usable when it was virtually at a right-angle to the front of the main unit.

The only major problem with the infra red system is that the path from the keyboard to the main unit has to be relatively free from obstructions. It doesn't mind the odd piece of paper or small box, but it does object if you use the keyboard on your lap and the lip of the desk gets in the way.

One interesting point is that keyboards are not keyed into individual systems. This means that you could line

up three or four F1s, pick up a keyboard, hit a key, and all the systems would register the key; this could be a problem if a number of people were using F1s in the same room. ACT has thought of this, and supplies a length of fibre optic cable which can be used to join the keyboards and system units to stop interference.

The rest of the keyboard is rather disappointing. The keyboards on both the Sirius and the original Apricot were very good. The F1 broadly follows the same path except for the function keys, which have been moved yet again and now live on the far right-hand side. The microscreen which adorns the 'old' Apricot keyboard has been dumped in favour of a more traditional layout.

The keyboard unit as a whole is ultra-low profile and very compact. The underside houses two flip-down legs to adjust the typing angle, and two removable panels which open to reveal the battery compartment and the main PCB. This houses the decode logic, infra red LED transmitters and the clock/calendar.

*'ACT's new colour monitor is a very impressive piece of kit. It uses a Sony Trinitron tube and electronics to achieve very high clarity combined with compact dimensions. Unfortunately you also have a couple of grands' worth of pre-production plastic casing, so I reviewed the system using a Microvitec colour monitor.'*

The top houses 92 keys plus four buttons marked RESET, REPEAT RATE, SET TIME and KEYBOARD LOCK.

The main qwerty typing area takes up two thirds of the available space with the rest being occupied by editing/cursor, numeric and function keys respectively. These functions are crammed together with no gaps between any of the functional groups.

All the function keys have pre-printed legends. Some of these, such as the HELP key, are fairly obvious choices; others, such as KEYWORD VOICE and SET UP are not so obvious. KEYWORD VOICE is used for voice control on the Apricot Portable and doesn't do anything useful on the F1. SET UP is used to transmit the time and date from the keyboard clock to the main unit when the system is booted up.

In use I wasn't particularly impressed with the keyboard. For the first time ACT is using a 'membrane' keyboard instead of the more traditional switch type. From a production point of view membrane keyboards have significant advantages — they are cheaper to produce, more compact and allegedly more reliable than conventional keyboards. The trouble is that I have yet to find one that feels anywhere near as good as a traditional unit.

The keys feel, look and sound just like the pieces in a Scrabble set and don't register until they have been pressed down quite forcefully. The space bar was a major problem: it's very close to the mains casing and doesn't register

until it's significantly below the casing's lip. When you are typing, your thumb catches on the edge of the casing and you have to make a conscious effort to pivot it down to make the key register. In fairness to ACT I was using a hand-made pre-production keyboard, but I can't see how the production units will be sufficiently different to make the problem non-existent.

Also supplied with the review machine was ACT's version of the mouse. A more apt name would probably be the rat, because it's about three times larger than most other mice on the market. It consists of a large ball and two buttons running down each side to enable you to select options.

Like the keyboard, the mouse communicates with the main unit via an infra red link. This caused me problems more than once, because I found myself pointing it at the cursor on the screen rather than at the main unit.

In addition to being able to mouse around the desk, the ACT mouse can be used as a trackerball. Anyone who has

played 'Missile Command' in the amusement arcades will know how a trackerball works. For the uninitiated, it's a large ball mounted in a holder. The cursor can be moved by running your hand over the ball and rotating it in the direction you want to go. In practice I found it easier to use the mouse as a trackerball than mousing all over the table.

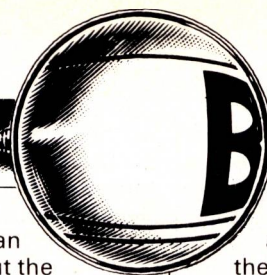
## System software

All the Apricot range supports MS-DOS, CP/M-86 and Concurrent CP/M 3.1. However, anyone who has used an Apricot will know that ACT has done a great deal behind the scenes to make it easier to configure the system: the old Apricot used about 120k of user RAM for the operating system.

The F1 has cut down on the size of the RAM BIOS by placing some of the operating system routines in ROM, but nevertheless the system still eats just under 90k of user RAM. Having said this, 40k of that is taken up by the bit mapping for the display, so things aren't quite as bad as they first seem.

The review machine was supplied with MS-DOS version 2.11 which is virtually bog-standard Microsoft. The only unusual behaviour exhibited by the machine was that it appeared to be doing some disk cacheing. When I typed DIR the operating system looked at what was on the disk and then printed it. However, when I typed DIR again it printed the directory straight away without bothering to look on the disk.





# BENCHTEST

On the old Apricot you can set aside a cache area, but the F1 shouldn't support this. It turns out that the cacheing was achieved by allocating more buffers to MS-DOS in the CONFIG.SYS file, rather than having a separate disk cache.

The machine was also supplied with GSX, a kind of graphics operating system. The problem facing people writing graphics software is that different micros have different ways of accessing the graphics screen. Graphics programs written for one machine probably won't run on another — GSX attempts to get around this problem.

GSX sits between the hardware and the applications program, and provides a consistent interface. As long as the program just accesses GSX's functions

in addition to being standard on the new ACT machines, it will eventually be retro-fitted to the existing Apricot machines.

Activity should autostart as soon as the system is booted. The review copy had to be called manually, which simply meant loading the appropriate GSX driver and then typing ACTIVITY.

Once loaded, the main screen is displayed in glorious technicolour. At the time of writing ACT programmers were arguing over what colours the different screens should be: consequently my version had a not-so-endearing habit of printing some sections as blue on blue!

Movement of the cursor around the Activity screen can be achieved either by using the ACT mouse, or by using the

command line for people who want to directly type their DOS commands rather than playing around with ikons.

There are six main control ikons which are displayed all the time you're in Activity.

From left to right they are: a picture of a pointing hand labelled 'Activity'; DOS, a computer labelled 'Utilities'; a disk labelled 'Disk', a question mark labelled 'Help' and a square with an arrow labelled 'Exit'.

'Activity' will always get you back to the main Activity screen, DOS allows you to perform operating system functions, and 'Utilities' allows you to get into either the ikon editor, character font editor, keyboard table editor or the system configurator.

The ikon editor was one of the features which didn't work on the review system. In theory it allows you to create your own ikons and store them on disk. You can then use them by making the appropriate entry in ACTIVITY.CON.

The character font editor allows you to alter the make-up of existing characters, or to make up new character sets of your own. The screen is broken up into three main sections: on the left are ikons for editing characters — rotate, delete, invert, and so on; the central section is the grid where you edit the character; and the right-hand side shows the source and the target fonts. When you have created your wonderful new character set you can save it to disk for later use. You can even save a header record describing your new work of art.

The keyboard table editor allows you to configure different keys on the keyboard to produce different strings. This is very useful for customising keyboards for applications programs such as WordStar, or you can configure certain keys to print often-used words.

The editor screen displays a graphical representation of the keyboard at the top of the screen. You select the key you wish to work on; the bottom of the screen then displays what the key is currently configured for. You can use the character set on the bottom right of the screen to re-define your key. When

*'It's very hard not to be impressed by the F1. It could have had less memory, no colour and no fancy software, and still be competitive in this sector of the market. Its main competition will come from the Sanyo MCP555, but the F1 scores over the Sanyo in a number of important areas . . .'*

and doesn't go directly to the hardware, it should run on any micro that has a GSX driver.

ACT has made extensive use of GSX to ensure that programs will run on all its machines regardless of display type. The current Apricot range has no less than four different types of display for its applications programs to cope with: the old Apricot has an 800 × 400 black and white display; the Portable has a 640 × 200 LCD display and an eight-colour 640 × 256 display; in addition, the F1 has a four-colour 640 × 256 screen. To write individual customised programs for each model would have been a nightmare, so ACT wrote one suite of generic applications programs and four GSX drivers. Obviously ACT is hoping that independent software producers will also use GSX to make their products portable across the Apricot range.

Anyone who has used the old Apricot will remember the Manager program, which was supplied in an attempt to keep the end user away from the terrors of the operating system. Whether you used it or not, it did come with some useful utilities and was at least a step in the right direction.

For its latest batch of machines ACT has developed the successor to the Manager to be known as 'Activity' (ACTivity — geddit?). This sits on top of the operating system, and makes extensive use of ikons and the ACT mouse in an attempt to be as friendly as possible. The whole package has been written in-house using a combination of Pascal MT+ and assembler. In

addition to being standard on the new ACT machines, it will eventually be retro-fitted to the existing Apricot machines.

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## Benchmarks

|     |      |
|-----|------|
| BM1 | 2.0  |
| BM2 | 6.0  |
| BM3 | 12.2 |
| BM4 | 12.5 |
| BM5 | 14.1 |
| BM6 | 25.8 |
| BM7 | 39.8 |
| BM8 | 38.6 |
| Ave | 18.9 |

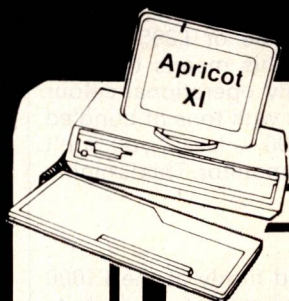
**All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.**



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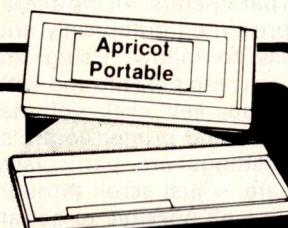
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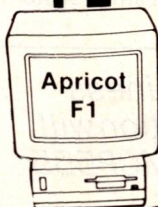
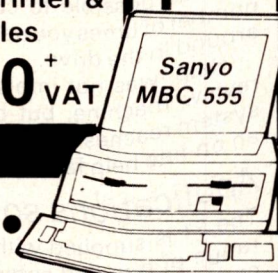


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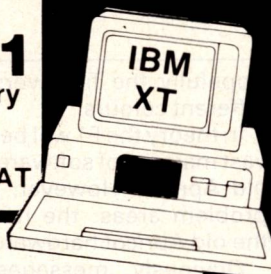
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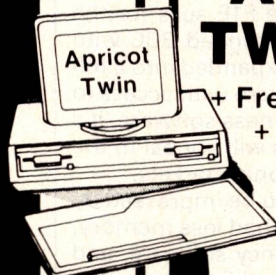


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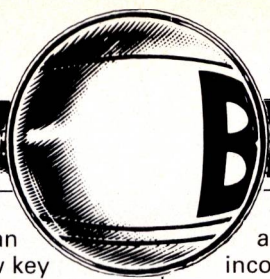
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## BENCHTEST

you have finished, you can get a print-out of the new key settings and save the layout to disk.

The system configurator is used to reset system parameters. All the alterations are represented graphically and are very easy to follow. Using the configurator you can play around with the bell volume, key click volume, RS232 protocols and printer controls. The RS232 settings are particularly easy to operate — just scroll through the options; it isn't possible to get an illegal command.

You can also use the configurator to load your previously saved fonts, keyboards and logos into the system so that they become the default settings.

The next main control icon is 'Disk', which allows you to perform most of the common housekeeping activities such as formatting, copying and verifying disks. When these options are chosen, the appropriate DOS function is called and Activity is reloaded. The idea behind this is that if you are doing a single disk copy, you need as much RAM as possible to cut down on the number of times you need to swap disks around in the drive.

'Help' was not implemented on the review machine, but by the time the system reaches the shops it will feature an on-line help facility.

### Applications software

The F1 is supplied with an impressive range of bundled software. From ACT come three packages: a tutorial, ACT Sketch, and Diary; from Sorcim come Superplanner, SuperCalc and Superwriter. The Sorcim packages are well known so don't need further description, but the two ACT packages are new for this machine.

ACT insists that ACT Sketch is not its version of programs like MacPaint. Its main purpose is to generate pictures which can be incorporated into applications programs.

Sketch has all the usual arc and line drawing facilities as well as colour filling. At one level you can use it to create a basic picture which can then be printed out, but its main feature is its ability to create a GSX command file. This has two advantages: a list of GSX commands takes up far less space than

a screen image, and you can incorporate the GSX commands into an applications program, thus making it very easy to write programs with a high graphical content.

The Diary program is a simple database application used to create an electronic desk diary (this is the package which is voice-driven on the Portable machine). This program also makes heavy use of graphics — the opening screen has a picture of a closed diary. The commands are very English-like: for example, to look at a particular page you say OPEN\_AT followed by the date or YESTERDAY, TODAY or TOMORROW. Unfortunately this package was a victim of the blue on blue syndrome which made it hard to use.

*'The F1 is pitched firmly at the £1000 business machine market. As such its main competition will come from the likes of the Apple IIc, Sanyo MCP555 and the Prism Wren.'*

Hopefully the final version will have different colours.

In theory the F1 will be able to run the vast majority of software written for the old Apricot. However, there are two problem areas: the microscreen and the old Apricot hardware.

Obviously, messages which were sent to the Apricot's microscreen won't be displayed on the F1 because it doesn't have a microscreen. ACT says it will provide a utility which re-directs microscreen messages to the 25th status line.

Programs which directly accessed the Apricot's hardware without going through the BIOS probably won't work. ACT says that these programs are in the minority, but programs such as Open Access will have to be altered. As I mentioned earlier, ACT hopes that software houses will use GSX in future.

### Documentation

As this was a pre-production machine, no documentation was supplied.

### Prices

The Apricot F1 is very good value for money. The system unit will set you back £995, and the monitors cost £200

for black and white or £395 for the colour version. This means that you could have a fully operational colour business system with tons of bundled software for £1390 — less if you don't want ACT's flash monitor. This is highly competitive.

### Conclusion

The F1 is pitched firmly at the £1000 business machine market. As such its main competition will come from the likes of the Apple IIc, Sanyo MCP555 and the Prism Wren. (This is an increasingly competitive and potentially lucrative area of the market: the thousand pound mark is a great psychological barrier for small systems purchasers.)

ACT is well aware that there are a large number of old Apples and PETs in the field which are now fully written down in the books, and whose owners are looking around for a replacement that's cheap and can perform the same fairly basic functions.

ACT is also making a concerted bid for a slice of the educational market with the F1E variant of the F1. Its main argument is that the F1E sells for the same price as an expanded BBC with disks, but it can be expanded into a full function business micro with access to a wide range of business software. It's easy to see how this will appeal to the higher level educational markets.

It's very hard not to be impressed by the F1. It could have had less memory, no colour and no fancy software, and still be competitive in this sector of the market. Its main competition will come from the Sanyo MCP555, but the F1 scores over the Sanyo in a number of important areas, the most important being its decent capacity disk drive.

My main worries centre around the keyboard, but even here the criticisms must be tempered by the machine's value for money. Also, I'm not sure how useful the infra red link is. ACT seems to be fond of gimmicks it can use to distinguish its products from the rest. The old Apricot has the microscreen which has been dropped on the F1; the F1 has infra red which will probably be dropped on the next machine...

The F1 is not designed to provide a powerful general purpose microcomputing facility. It's for people who need a good value micro to perform one or two tasks well. Given its chosen market, I can't think of anything that comes close. Very good.

END

### Technical specifications

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| CPU:               | Intel 8086 clocked at 4.77MHz.                                         |
| RAM:               | 256k.                                                                  |
| ROM:               | 32k.                                                                   |
| Display:           | Up to 640 × 256 displaying four colours out of 16.                     |
| Keyboard:          | 92 keys, membrane construction.                                        |
| I/O:               | RS232, centronics, composite video, RGB video, system expansion bus.   |
| Operating systems: | MS-DOS, CP/M-86, Concurrent CP/M3.1.                                   |
| Bundled software:  | ACT Sketch, ACT Diary, Tutorial, Superplanner, SuperCalc, Superwriter. |



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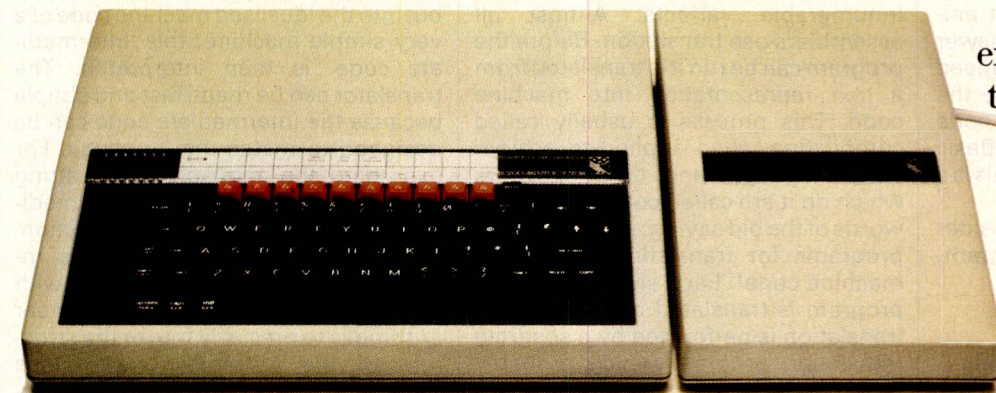
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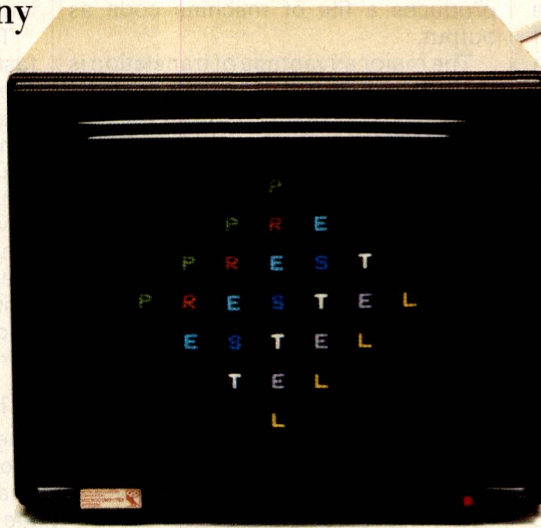
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# Eureka!

*Compilers play a large part in computer programming but what are they, how do they work and how do you choose a good one?*

*Ric Wickham provides the answer.*

Budding Basic programmers invariably run out of speed as soon as they try complex real-time games or fast animated graphics. The traditional answer is to code the bits that need more speed in machine code. This has led to the general impression that machine code programs are fast but hard, and Basic programs are easy but slow, but this is a gross oversimplification.

To see why, we need to consider language levels and types of programming system.

## Language levels

Computer languages divide into 'high' and 'low' levels, terms which have evolved from 'problem oriented' and 'machine oriented' languages respectively.

A high-level language, typified by Pascal and Basic, uses English-like commands to specify a sequence of operations to the machine. To use such a language, you must know how to solve your problem: the language is used to describe that solution to the computer.

Low-level languages correspond to assembly codes. Each statement in the language corresponds to a single data object or a single machine code instruction. Some languages allow sequences to be grouped together so that a single statement can give rise to a whole sequence: this kind of group is called a 'macro'. To use a low-level language you really need to know how the machine works, because you must describe to the machine how you think it should solve the problem. You need to be able to remember the names of the machine instructions and understand what they do.

The hexadecimal and decimal machine codes used by many micro enthusiasts are at an even lower level, one totally ignored by most programmers in the computing industry. At this level you not only have to understand the instructions, but also remember (or keep referring to) the decimal or hexadecimal number which is represented by an assembler mnemonic.

## Types of programming system

There are two main ways in which a

computer can execute a program — translation and interpretation, plus innumerable variants. Almost all assemblers use translation. Before the program can be run it is translated from a text representation into machine code. This process is usually called compilation when applied to a high-level language, and the translators which do it are called compilers. In the words of the old saying: 'Compilers are programs for translating errors into machine code!' Each statement in the program is translated only once. The translation is performed by a separate translation program which probably has to be loaded and run (some micros, such as the BBC machine, have assemblers built in). The translation program takes the text of the user's program (the 'source text') as input and produces a file of machine code as output.

The major advantage of translation is that the resulting machine code programs are very fast, but there are two principal disadvantages, both relatively minor. One is the necessity of loading the translator program; the other is that all the name information from the original source program is usually thrown away by the compiler, so the diagnostic messages from a failed compiler program generally leave a lot to be desired.

The method used by almost all Basic systems on micros is 'interpretation'. The program is run by inspecting each source line of the program in execution order. As each statement is analysed, data areas representing the variables of the program are changed as if that fragment of program had been directly executed. It follows that a statement in a loop is analysed each time the loop is executed, and this re-analysis of the source text makes interpreters slow.

The main advantage of interpretation is the superior diagnosis ability of the programs it runs. Since the source is present during execution, and the interpreter is using it directly, error messages are given in source-language terms. Many interpreters allow a program to be interrupted; the programmer can then change variables and in some cases even edit the program, then resume execution.

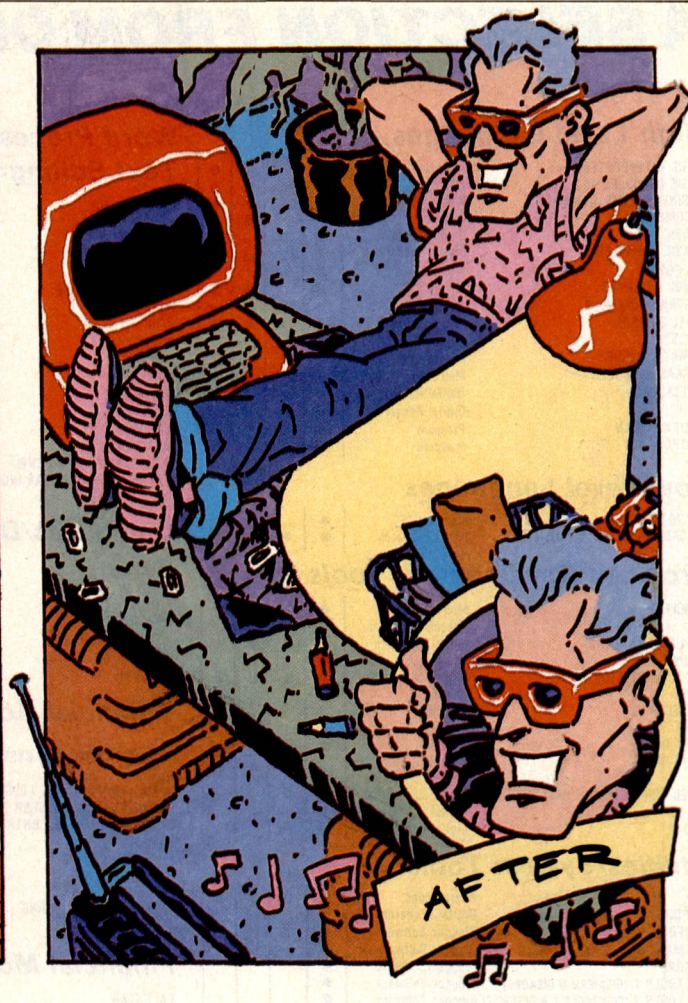
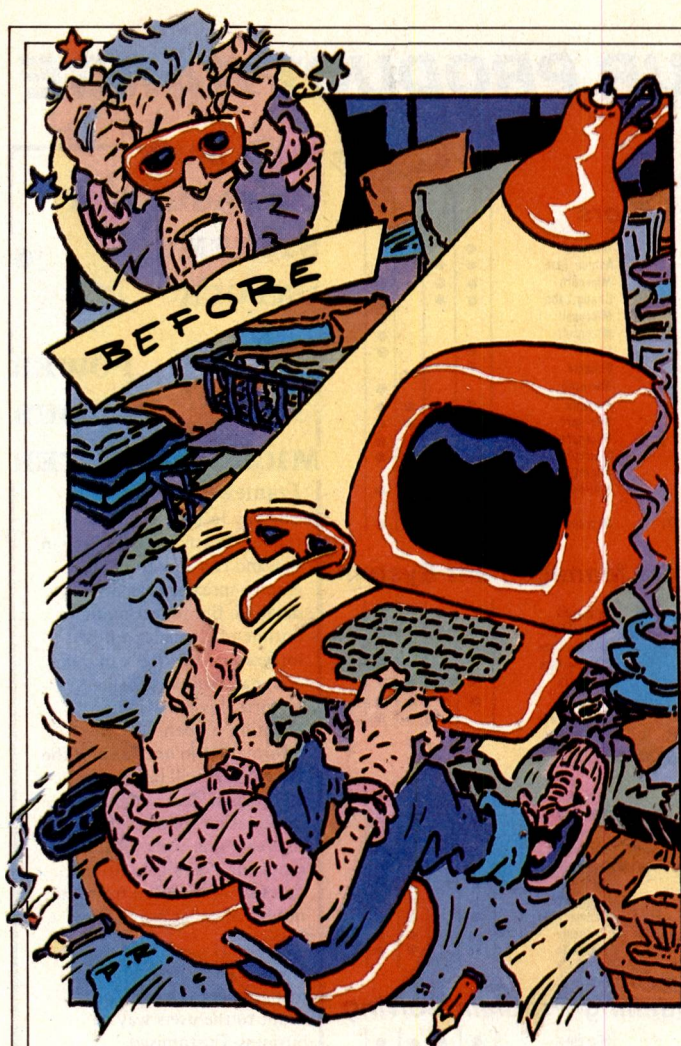
Most programming systems translate programs not into machine code, but into the idealised machine code of a very simple machine; this 'intermediate code' is then interpreted. The translator can be made fast and simple because the intermediate code can be designed to match the language. For example, if the language needs a string comparison operation, the intermediate code can have a single 'instruction' to perform that operation. The intermediate code can be provided with stack operations and real number arithmetic to precisely mirror the structure of the arithmetic expressions found in most programming languages; this greatly simplifies code generation. Even the mechanisms provided to find variables can be tailored to the declaration rules of the source language.

This makes the translator smaller, faster and easier to write (and more likely to be correct). The interpreter which runs the code will go much faster running the intermediate code than an equivalent interpreter will directly running the original source, since it doesn't have to read the individual characters of the source program, analyse the statements or look up identifiers in a dictionary. The compiler has done this and encoded the results in the intermediate code.

## The translation process

The first stage of the compilation process is normally called 'lexical analysis'. This stage reads the source file and combines the characters it contains into 'symbols'. Each symbol is a single object in the source language: a name, a reserved word (such as LET in Basic), a string ('complete with quotes'), a number of various kinds of operator. This stage also removes any characters which don't add anything to the meaning of the program: spaces, new lines, comments, and so on. Quite often, the lexical analyser will generate all the error reports the compiler can produce, because it 'knows about' the source text and can therefore identify errors with particular characters on particular lines of the source. The output from the lexical analyser can be thought of as a series of strings. More





usually, the lexical analyser is a procedure which puts the string for the 'next' symbol in a standard place each time it's called.

The next stage is 'dictionary look-up': this is called to turn the strings produced by the lexical analyser into numbers so that they can be manipulated more easily by the rest of the compiler. After a symbol has been looked up it is described by the class of symbol (name, operator, and so on), and the index of the entry in the compiler's dictionary which holds its text. Such a description is usually called a *token*. If a given symbol is used many times in a program, the dictionary entry used is the same each time; a given name is always represented by the same token, wherever it occurs in the source.

There is a common combination of lexical analyser and dictionary look-up, in which the lexical analyser recognises all symbols except names and directly converts them into tokens. Numbers are represented by a token which specifies that its type is 'number', and gives the value represented instead of the index of an entry in the dictionary. Strings are represented by writing them into a special string buffer. A token is passed giving type of string and a value which specifies which string in the buffer is being represented. Names are looked up in the dictionary, which can now be a subroutine of the lexical

analyser rather than a process in its own right. Only names are held in the dictionary, which reduces the number of entries to be searched and the number of searches performed.

The tokens are passed next to 'syntax analysis'. This stage works out what the programmer's instructions are by analysing the structure of the program according to the structure rules (syntax) of the language. Particular statements can thus be identified as, for example, declarations or assignments, conditional or loop, as appropriate. There are a number of ways of doing this, and even a number of ways of automatically generating this part of the compiler.

The output from the syntax analyser is a data structure which represents the entire program. Since a real data structure is very large and complex to control, a micro compiler is more likely to represent it as a series of procedure calls, where the sequence of calls gives the shape of the structure and the parameters of the calls give the values in the structure. Even large compilers often use this procedural interface; mainframe compilers such as the BCPL compiler use the calls to build the structure, while micro compilers manipulate the information directly. (In fact, some mainframe compilers do too, notably the 'standard' Pascal compiler.) Again, it's possible to compromise: for example, by building a structure for a subset of the language (express-

ions are the favourite), using it as appropriate and then discarding it.

Whether the structure is built or not, it is conceptually passed to 'semantic analysis'. This analyses the structure of what the programmer wrote and works out what he meant. There are three main parts to semantic analysis: name analysis, expression analysis and macro generation.

Name analysis inspects every declaration to ensure that it's legal and finds out what it means, and also inspects every use of any name and relates it to the correct declaration. Most Pascal-like languages allow you to re-use names provided you don't use them ambiguously. The rules for doing this are called the 'scope rules' and vary enormously, from Dartmouth Basic (never re-use anything) to ADA (you can do anything you like provided the compiler can sort it out). Name analysis enforces the scope rules.

The second major function of semantic analysis is expression analysis; this is often so primitive that it's hardly recognisable as a separate function. It involves re-ordering expressions (keeping the operators in the same hierarchy so that the expression still means the same) to making the best use of the machine while evaluating them.

For example, if you write  $5 + 3 * A$  the compiler might be fooled into generating code to load the 5 into a register before doing anything else: this wastes



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| COBOL COMPILER          | Microsoft        |
| FORTRAN COMPILER        | Microsoft        |
| LEVEL 2 COBOL           | Micro Focus      |
| MULISP                  | Microsoft        |
| MUMATH/muSIMP           | Microsoft        |
| PASCAL COMPILER         | Microsoft        |
| PASCAL MT+              | Digital Research |
| PL/I                    | Digital Research |
| PROFORTRAN              | Prospero         |
| PROPASCAL               | Prospero         |

## Low Level Languages

|                          |                  |
|--------------------------|------------------|
| MACRO-80                 | Microsoft        |
| PROGRAMMERS UTILS (RASM) | Digital Research |

## Program Development Tools

|                           |                  |
|---------------------------|------------------|
| ANIMATOR                  | Micro Focus      |
| BUG                       | Phoenix Software |
| DISPLAY MANAGER           | Digital Research |
| FTNUMB                    | Micrology        |
| LEVEL II ANIMATOR         | Micro Focus      |
| PASM                      | Phoenix          |
| PDEVELOP                  | Phoenix          |
| PLINK                     | Phoenix          |
| PLINK II                  | Phoenix          |
| PLINK-86                  | Phoenix          |
| SID                       | Digital Research |
| SPEED PROGRAMMING PACKAGE | Digital Research |
| XLT-86                    | Digital Research |
| ZSID                      | Digital Research |

## Utilities/System Tools

|                                      |                      |
|--------------------------------------|----------------------|
| CLIP                                 | Keele Codes          |
| DESPOL                               | Digital Research     |
| DISKED-2                             | Slogger Software     |
| DISKMAN                              | Slogger Software     |
| DISKORG                              | Slogger Software     |
| DISKTOOLS-1 (DISKMAN & DISKORG)      | Slogger Software     |
| DISKTOOLS 2 (DISKTOOLS-1 & DISKED-2) | Slogger Software     |
| dUTIL (FOR DBASE-II)                 | Fox & Geller         |
| FILESARE                             | Micro Focus          |
| DEC RAINBOW SERVICE S/W:             | Silicon Valley Corp. |
| (1) Format/Verify Service            |                      |
| (2) Autorun Service                  |                      |
| (3) Function Key Service             |                      |
| SERVICE S/W VOL. 1 (1, 2 & 3)        |                      |
| THE OPERATING GUIDE                  | Decision Systems     |

## Sorting

|           |           |
|-----------|-----------|
| MSORT     | Microsoft |
| SUPERSORT | Micropro  |

## Code Generators

|                      |                   |
|----------------------|-------------------|
| AUTOCODE             | Stemmos           |
| FORMS-2              | Micro Focus       |
| QUICKCODE            | Fox & Geller      |
| SOURCEWRITER         | Softwright        |
| THE LAST ONE         | D.J. 'AI' Systems |
| THE LAST ONE—COMPACT | D.J. 'AI' Systems |

## Telecommunications/Conversions

|                                        |                   |
|----------------------------------------|-------------------|
| BACDEBIT                               | Comley            |
| BACSCOPY                               | Comley            |
| BSTAM                                  | Byron Software    |
| BSTMS                                  | Byron Software    |
| ICL C03 EMULATION (Bulk)               | Synchro Systems   |
| ICL C03 EMULATION (Interactive)        | Synchro Systems   |
| ICL C03 EMULATION (Interactive & Bulk) | Synchro Systems   |
| REFORMATTER CP/M ↔ DEC                 | Microtech Exports |
| REFORMATTER CP/M ↔ IBM                 | Microtech Exports |

## Word Processing/ Text Editing/Editors

|                       |             |
|-----------------------|-------------|
| EDIT-80 V2.02         | Microsoft   |
| FRIDAY                | Ashton Tate |
| MAILMERGE             | Micropro    |
| MEMOPLAN              | Chang Labs  |
| WORD                  | Microsoft   |
| WORD WITH MOUSE       | Microsoft   |
| PARAGRAB              | Focus       |
| PEDIT                 | Phoenix     |
| PLANSTAR              | Micropro    |
| PMATE                 | Micropro    |
| SPELLSTAR             | Micropro    |
| STARBURST             | Micropro    |
| STARINDEX             | Micropro    |
| WORDMASTER            | Micropro    |
| WORDSTAR              | Micropro    |
| WORDSTAR PROFESSIONAL | Micropro    |
| [WS+MM+SS+STAR INDEX] |             |

## Databases/Data Management Systems

|            |             |
|------------|-------------|
| DATASAR    | Micropro    |
| dbASE-II   | Ashton Tate |
| FRIDAY     | Ashton Tate |
| FRAMEWORK  | Ashton Tate |
| INFOSTAR   | Micropro    |
| REPORTSTAR | Micropro    |
| dbASE III  | Ashton Tate |

## Financial Accounting

|                                 |         |
|---------------------------------|---------|
| INCOMPLETE RECORDS SYSTEM       | MPI     |
| NOMINAL LEDGER                  | Padmede |
| OPEN ITEM PURCHASE LEDGER       | Padmede |
| OPEN ITEM SALES LEDGER          | Padmede |
| PADMEDE BUSINESS CONTROL SYSTEM | Padmede |
| PAYROLL                         | MPI     |
| PURCHASE LEDGER                 | Padmede |
| SALES INVOICING                 | Padmede |
| SALES LEDGER                    | Padmede |
| TIME & COST RECORDING           | Padmede |

## Financial Modelling/Problem Solving

|                           |                    |
|---------------------------|--------------------|
| CALCSTAR                  | Micropro           |
| DECISION ANALYST          | Executive Software |
| LINEAR & GOAL PROGRAMMING | EAS                |
| MATHSPACK                 | MPI                |
| MICROPLAN                 | Chang Labs         |
| MULTIPLAN                 | Microsoft          |
| PLANTRAC 1                | Computerline       |
| PLANTRAC 1+               | Computerline       |
| PROFIT PLAN               | Chang Labs         |
| QSTAT                     | Pivotal Software   |
| STATSPACK                 | MPI                |
| TKI SOLVER                | Software Arts      |
| TKI SOLVER PACKS          |                    |
| FINANCIAL MANAGEMENT      |                    |
| MECH ENGINEERING          |                    |

## Business Applications

|                  |                       |
|------------------|-----------------------|
| JOB COSTING      | Heseltine             |
| POLICY MASTER    | CSA Micro Systems     |
| PRINT ESTIMATION | Software Mgmt Systems |
| STOCK CONTROL    | Padmede               |

## Training Aids

|                 |                  |
|-----------------|------------------|
| CP/M TUTOR      | Syntax Software  |
| KEYBOARD MASTER | Anthony Ashpitel |
| TYPING MASTER   | Anthony Ashpitel |

## Graphics

|        |              |
|--------|--------------|
| dGRAPH | Fox & Geller |
|--------|--------------|

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a register. On a single-register machine the 5 would immediately have to be stored somewhere while the machine evaluated  $3 \times A$ , which might also waste a temporary storage location. The generated code would look something like this:

```
Load      5
Store     Temp
Load      3
Multiply  A
Add       Temp
```

whereas if you had written ' $3 \times A + 5$ ', which means the same, the code might have been:

```
Load      3
Multiply  A
Add       5
```

Expression analysis, if it exists, is simply a set of routines in the compiler which implement some simple laws of arithmetic — for example, that  $A+B$  is

in a register. This tends to happen in sequences such as:

```
A := 0;
B := 0;
```

which a simple compiler might translate into:

```
Load      0
Store     A
Load      0
Store     B
```

It also happens in sequences such as:

```
A[i] := A[i] + 1;
```

where the compiler may not notice that an index register already contains the variable 'i' when it comes to generate code for the second access to 'A[i]'.

## Organisation of a compiler

A compiler will typically consist of:

- (1) Lexical analysis and dictionary look-up;

'more clever'. The disadvantage is the operational complexity of handling several subprograms which must be linked together, and the time and disk space required for several intermediate copies of the program. (It's possible to run a multi-pass compiler on a tape-based system but I wouldn't recommend it). There are also problems merging error messages from different parts of the compiler into a report which the user can understand.

The other extreme way to organise a compiler is to pass each symbol, token, structure or macro onto the next part of the compiler as soon as it has been generated. Essentially, such compilers pass a piece of the source program right through every function of the compiler, then go back for the next bit. In practice there is always some overlap: such a compiler is called *single pass*.

The advantage of a single pass compiler is that it's a single program which uses no temporary resources (disk files, and so on), so is operationally convenient even for a cassette tape-based system. The disadvantage is that it all has to go into mainstore at once, together with the dictionary and any data structures that it may use to describe the program. On machines with no start/stop facility on their cassette interface, the source code and the generated machine code have to fit in too. Even considering exceptions to this rule, most micros are far too small to hold a really good compiler in one pass.

Again, compromise is possible. To eliminate the cost of writing and re-reading the intermediate files, one Fortran compiler for a tape-based system (the IBM 1401) modified the source program in store, reading successive passes of the compiler into a tiny reserved area. This area was so tiny, the compiler had 64 passes.

## Organisation of the machine code

There are three main ways to organise the machine code produced by a programming system: it can be left in store ready to be executed; it can be written to an external file (tape or disk)

the same as  $B+A$ , and that 'NOT (A AND B)' is the same as '(NOT A OR NOT B)'. Clearly this is easier to do if the semantic analyser has a structure in store which describes the whole expression and which it can modify, which is why some compilers build structures to describe the complete program and many of the ones that don't at least build structures for expressions. However, it's possible to do re-ordering without building the structure.

The semantic analyser must call the code generators to produce the final program. Each code generation procedure usually corresponds to a macro in the sense described in connection with assemblers. The semantic analyser decides upon the general sequence of operations to be performed and calls the final stage of the compiler — the code generator — to produce it.

It is only here that translators and interpreters part company; at this stage, compilers produce code whereas interpreters perform the specified operations.

Some functions of a code generator are fairly simple: planting code in response to calls from the semantic analyser, allocating and organising space for variables, keeping a list of the addresses of labels, and so on. However, the code generator can do many other useful things too: it can look to see what you are loading and storing, so that if the semantic analyser tells it to load something it has just stored, it can remember that it already has the value

- (2) Syntax analysis;

- (3) Semantic analysis including name and expression analysis; and

- (4) Code generation.

These can be organised in various ways. Again, there are two extremes and several compromises.

Each function can be applied to the entire program in turn. This produces a 'multi-pass' compiler which reads the program (or some representation of it) several times. The scheme above, with the functions grouped as shown, leads to a four-pass compiler in which pass one turns the program into a stream of tokens, pass two turns the string of tokens into a string of directives to build a syntax tree, pass three turns the tree into a string of macro calls, and pass four turns the macro calls into machine code. Each intermediate form of the program contains control information, and may contain hints from the previous pass.

*'Many interpreters allow a program to be interrupted; the programmer can then change variables and in some cases even edit the program, then resume execution.'*

The advantage of a multi-pass compiler is that each pass can fill the main store of the machine; the total size of the compiler can therefore be larger than the main store size, which allows the compiler to be correspondingly

in whatever standard the machine requires ready to be reloaded by standard facilities; or it can be written in a *relocatable* or *linkable* form which allows it to be processed by a special

*continued on page 166*



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continued from page 163

loader, and either put anywhere in main store or linked to other programs. Although the relocation and linking facilities are logically separate, they are normally provided together. There is

machine code file for the relocating loader to find all the program-dependent places and patch them to the right values for a particular run. Such loaders normally have some facility to combine areas together by *external*

*'If you choose a multi-pass compiler, make sure that the passes all load and call one another: it can be operationally inconvenient to control them yourself. Two-pass assemblers work rather differently and don't present this problem.'*

usually no reason to relocate a completed program.

Leaving the program in store is called *compile and go*. This saves the file store and time to dump and reload the program, and is operationally convenient. However, unless the standard facilities on the machine allow you to take copies of main store, there is no way to save a copy of the compiled program; you must recompile it every time you wish to run it. Don't panic — you can save arbitrary areas of store on most machines and even on those where you can't (for example, the TRS-80 where you can get utilities to do it for you).

Leaving the program in store means you can't normally compile a program to occupy the same addresses as the compiler, but there are exceptions. Some compilers, and more assemblers, build the program in one place but fix up its jumps as though it were in another. The last thing such a system does is move the program to where it ought to be.

## Writing code to a file

The most common organisation for machine code is to write it to a file ready to be reloaded (in a fixed place) and executed. The compiler (or assembler) writes the code in any odd corner of store that it can find, as though it were at the correct address. The code is then written to a file with control information which will ensure that it's reloaded into the correct address, not the address it was dumped from.

The disadvantage of writing absolute code to a file is the extra step required to reload the program before it can be run. If this step is mandatory it can be irritating, particularly for small programs where everything has to fit into the main store. Another disadvantage, which applies to assemblers rather than compilers, is that such translators won't usually allow you to specify more than one ORG statement to say where the generated code is to go.

The relocating organisation relies on the compiler or assembler putting enough extra information into the

*reference*, either named (as in Pascal) or numbered (as in BCPL). This allows a library of procedures for common tasks to be written, compiled once and then incorporated into any program that requires them. This scheme also allows construction of programs which occupy nearly all main store (except for the bit taken up by the relocating loader itself, typically very small).

Again, you cannot specify the load address freely in your source program; in fact in most systems you can't specify it to the compiler at all, but tell the loader where you want things. The disadvantage of this scheme is its complexity. The main advantage, overwhelming if you write a lot of similar code, is that a change to one module of a multi-module program doesn't automatically mean recompiling the whole thing, even if the module you have recompiled has become larger and other modules of the program have to move to make room for it. The loader will just relocate them for you.

## Choosing a compiler

Your choice of compiler obviously depends upon the inherent capabilities of your machine. The owner of a BBC Micro is less likely to want to buy a Basic compiler than the owner of a Spectrum because he already has a very fast Basic interpreter which will compile assembly language inserts. Spectrum Basic is

How anyone can claim that a compiler which won't compile arrays is a 'Basic' compiler I don't know — but some people do. The buzzword is *subset*: many compilers only compile a restricted language called a subset. This is fine, but some subsets are extremely small. Be sure you know what you're buying.

If you choose a multi-pass compiler, make sure that the passes all load and call one another: it can be operationally inconvenient to control them yourself. Two-pass assemblers work rather differently and don't present this problem.

If you need the ultimate in performance you need a compiler which compiles to machine code. However, for a language like Pascal this will almost certainly mean accepting restrictions on the level of supported language: it will be a smaller subset. This is because the scope rules for Pascal are too complex for most micros to support in full in machine code.

## Warning

Beware of highly optimising compilers written by firms you've never heard of. Optimisers sometimes get confused by unusual sequences of code. Such bugs are hard for manufacturers to find because they can't test every optimising path under every possible precondition of the compiler. If you hit such a bug, a perfectly correct program will simply 'go wrong' and you'll go mad trying to discover why.

Finally, the thing you should do first: look at the error messages the compiler produces when you give it an incorrect program. The American professor, D Knuth (who wrote a series of books called *The art of computer programming*) remarked that, of programs run in his university, 90 per cent are 'short, Fortran and wrong'. The language is all that has changed!

A compiler should tell you which part of your program is wrong and what it thinks is wrong with it. It should tell you this in plain English, not numbers, and if the error is misuse of a name it should

*'A compiler should tell you which part of your program is wrong and what it thinks is wrong with it. It should tell you this in plain English, not numbers, and if the error is misuse of a name it should tell you which name. It shouldn't produce an "error number" and expect you to look it up . . .'*

slower because the interpreter is simpler. (This is why the Spectrum can have more storage than the BBC machine; in this game everything's a compromise!). Also, the Spectrum has no easy machine code facilities.

It's also worth looking at the language which the translator translates.

It shouldn't produce an 'error number' and expect you to look it up (the machine is better at looking up things than you are). The only exception is a cassette-based single pass system, where the space required to store the texts for all the messages is likely to be too great. **END**



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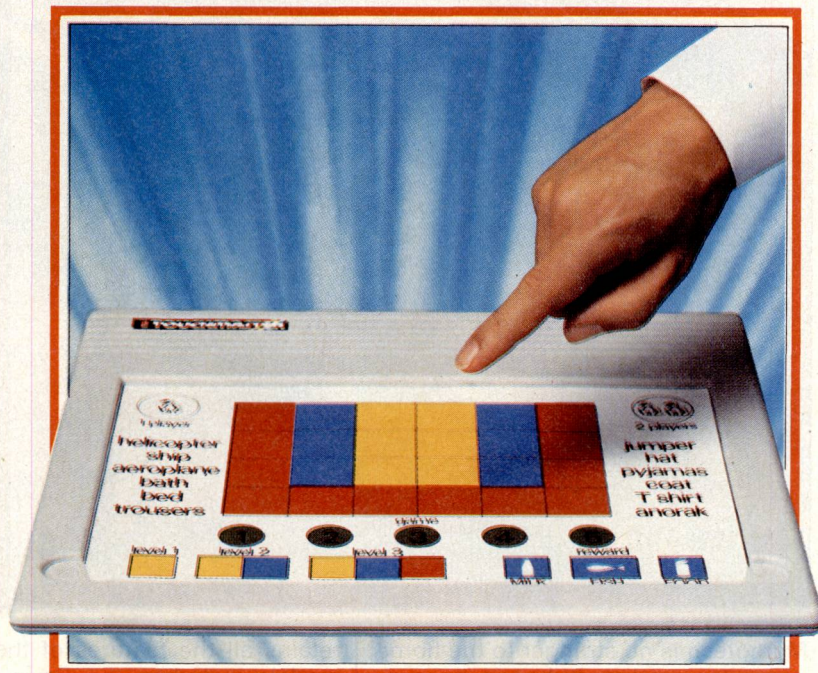
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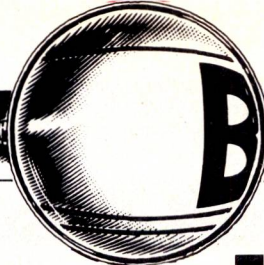
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# Memotech RS128

*Memotech's former excursions into the micro market have received critical acclaim, but it looks as though the RS128, a home computer with immense expansion potential, will be the machine that earns the company most praise. Tony Hetherington takes a look.*



Memotech is no stranger to the home computer market. It began by supplying memory expansions for the ZX81 and has progressed to its own range of micros.

The MTX 500 and 512 started the range last year with limited success, but now the icing has been added to the cake with the launch of the RS128. It

retains all the features of the earlier models including the Basic, built-in assembler and a text display language called Noddy, and adds an impressive 128k of memory, two RS232 interfaces and a cable to connect it to the FDX disk system. All this is available for a starting price of £399, which can be expanded, via the disk system, to a full CP/M micro

for £1250.

## Hardware

The RS128 is supplied in a box along with a power supply, leads, demonstration cassette and full documentation. Also supplied with the review machine was an FDX disk system, which converts the RS128 into a fully-fledged



CP/M system, and a Pascal ROM board.

The machine is housed in a beautifully-styled black brushed aluminium case with a sports car style stripe along the top.

The keyboard houses 79 keys divided into 57 keys which form the standard qwerty layout, a numeric keypad which doubles as cursor control and editing keys, and a group of eight function keys which, with the shift key, provide 16 programmable function keys. There are two additional unmarked keys at either side of the space bar which reset the computer when pressed simultaneously.

The keys are nicely spaced and have a good positive feel. It's obvious that some time has been spent on the board's design, for not only is it well laid out, but the F and J keys have deeper recessions for easy fingertip recognition during typing.

Aluminium is an unusual choice for a computer casing — it's normally plastic — but was presumably selected because of its ability to dissipate heat while shielding the electrical components from interference.

Along the back of the casing is an impressive array of outputs and interfaces, including two RS232 interfaces and a centronics printer port. Above the interfaces is a slot through which a ribbon cable connects the RS128 to the FDX disk system.

Both TV and composite monitor output are provided along with a hi-fi for channelling the sound through your amplifier. Power is fed into the computer via a din plug through an attractive power supply which has an on/off switch on one side. — it's surprising no one has thought of it before!

Two standard joystick interfaces, a cassette microphone and ear sockets complete the back of the micro. There's also a cartridge slot in the left-hand panel of the unit.

Unscrewing the side panels allows you to lift the hinged lid of the computer giving access to the inside, two thirds of which is dominated by the main circuit board featuring the now familiar Z80A processor. As in the MSX machines, the graphics capabilities are provided by the remarkable TMS 9918A series video chip from Texas Instruments. This time, however, the sound is supplied by

boards — the review machine was such a hybrid. The boards are easy to fit or remove as they are guided into the right place by two grooves running the length of the computer's innards.

The Pascal ROM board is one of two boards available, the other being a ROM-based word processor called NewWord. Unfortunately, there's only room inside the machine for two boards, so if you wish to use the Pascal board you should substitute it for the RS232 board, as it's unlikely that you'll require both at the same time. You should, of course, replace the RS232

---

*'The RS238 retains all the features of the earlier models including the Basic, built-in assembler and a text display language called Noddy, and adds an impressive 128k of memory, two RS232 interfaces and a cable to connect it to the FDX unit.'*

---

another Texas chip, the SN76489A.

The main board comprises 24k of ROM. This also contains MTX Basic and, among other delights, a built-in assembler. The video chip is accompanied by its usual 16k of video RAM, but the user RAM is made up to the required 128k by an expansion board which plugs into the right-hand end of the main PCB. Another plug-in RS232 communications board completes the inside of the machine.

It's these two boards that form the difference between the RS128 and its predecessor, the MTX512. Indeed, it's from these boards that the computer's name is derived — RS(232) 128(k) = RS128. An MTX512 can be upgraded to an RS128 by the inclusion of these two

board when you wish to use the FDX disk system.

The FDX is housed in a matching black brushed aluminium case and is large by any standards. Together with the RS128 and a monitor it forms a neat business system which would be equally at home in the office or on the dining room table. Set in the front of the FDX unit are two 500k 5¼in disk drives, an on/off switch and a fan. The FDX connects to the RS128 via a ribbon cable fitted into the bottom of the unit. A power lead runs from the back of the FDX to the RS128 which replaces the RS128's own supply. The video output is also via the FDX's 80-column board, and can deliver either monochrome or 16-colour RGB.



Two 500k 5¼in disk drives, an on/off switch and a fan sit at the front of the FDX unit



In addition to the disk drives, the review machine had a 256k silicon disk. This is basically an area of memory which the operating system treats as a disk drive. Consequently, applications software can be rapidly loaded and accessed at speeds that dramatically increase the package's performance. This can make the difference between a package that's useful but time consuming and an invaluable piece of software.

The review FDX system could be expanded by the addition of two further disk drives and up to three more silicon disks.

## System software

When you switch on the RS128 you are

faced with a dead screen — an all too common occurrence. The only movement is a flashing white cursor, below which appears the message 'Ready'. This is a shame since it hides the machine's best facilities: the RS128 user has access to MTX Basic or an interactive text language called Noddy, and a built-in assembler complete with display panel. According to Memotech, Noddy does for text what Logo does for graphics. I assume this means that the principles of programming are grasped through small, easy-to-learn steps.

A Noddy program is a collection of pages that contain either data or programs. A data page is easy to create and once you've given it a title you're

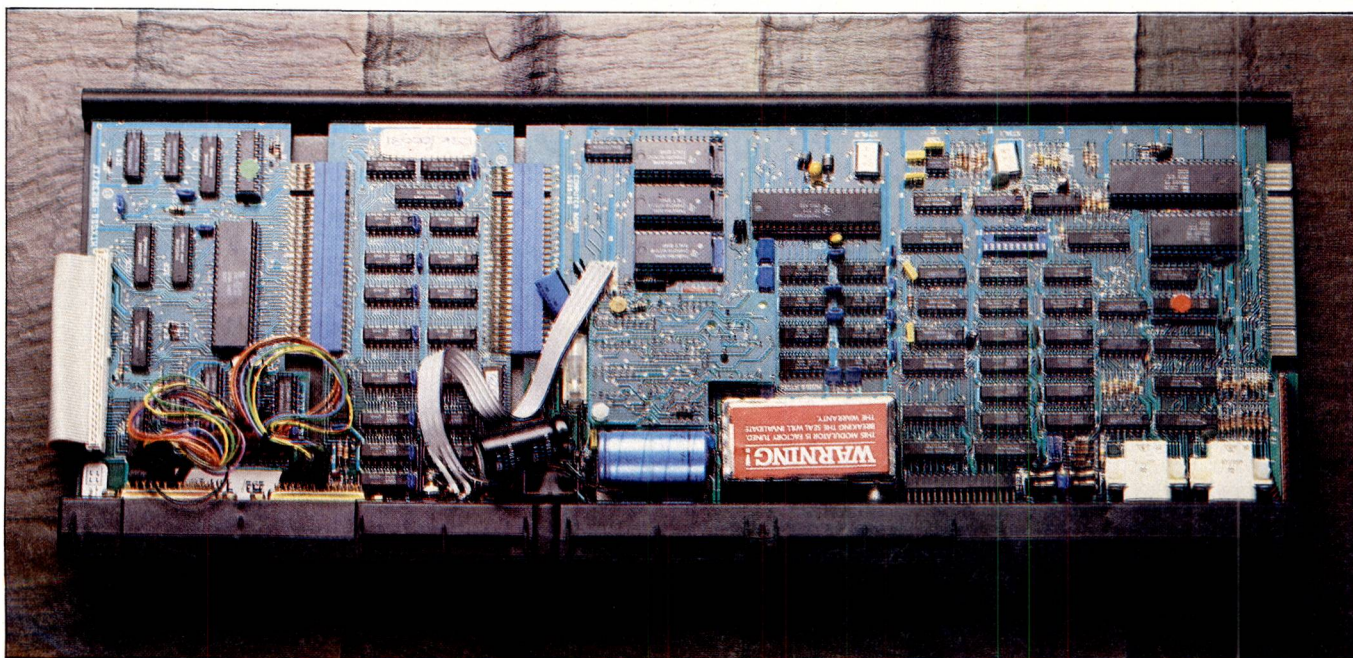
free to type any data you want, be it an address, recipe or menu.

A Noddy program is written on a program page and is constructed from only eleven commands. These are easy to understand and include DISPLAY to show a data page, ENTER to test for keyboard input, IF to test for a condition, and BRANCH and GOTO to jump to another part of the program. Noddy programs are run from Basic by the PLOD command (as in PC) and control is returned to Basic with the RETURN command. Each command is prefixed by an asterisk, so it's easy to distinguish a Noddy program from one written in Basic.

Noddy is a comparatively new language and is still in its infancy, conse-



The keyboard houses 79 keys, divided into three clearly-defined areas. They are nicely spaced and have a good positive feel



The machine's name is derived from the plug-in RS232 comms board and the (128k) RAM expansion board



quently little is known about it. It has some interesting aspects, particularly the ease with which pages of data can be displayed onscreen. The majority of RS128 users will skip Noddy and go straight into Basic, which is a shame for it certainly has potential. It will not replace Logo as a teaching aid for children, but it may be suitable for adults learning programming since it provides more useful examples than a turtle moving round a screen. If nothing else, you should bear it in mind for screen display subroutines to be incorporated into Basic programs: for

be created from moving sprites over the plane. If any pixels are left transparent the background colour of the backdrop plane will show through, thus completing the picture.

The sprite planes are larger than the screen area and the other planes. They are a massive  $8196 \times 8196$  pixels, so you can move sprites around without them appearing on the screen: this is useful if you want to have something circling the screen which leaves one side of the screen and after a delay emerges at the other side.

The sprite planes are parallel to the

be ordered to follow points or lines drawn on the pattern plane. These points or lines are drawn by the machine's remaining high resolution graphics commands. These include PLOT to draw a point, LINE to etch a line, and CIRCLE.

The Memotech's text screen has a resolution of 24 lines by 40 characters, but is split into eight virtual screens. MTX Basic uses five of these: the editor screen (four lines), the list screen (19 lines), the graphics screen, the whole screen (24 lines), and the one line message screen. These are numbered VS0, VS1, VS4, VS5 and VS7 respectively. These virtual screens can overlap each other and are selected by the VS command. MTX Basic only uses five, which leaves the other three for you to define as you wish through the CRVS command. Such virtual screens or windows can be set to any size and can be used for either text or graphics. You can redefine one of the screens used by Basic, but this will be taken from you whenever you return to Basic.

It's interesting to compare MTX Basic with MSX Basic since the RS128 has the same processor and video chip as found in MSX machines (for example, the Sony). Both Basics have excellent sprite facilities, but the RS128 forfeits powerful interrupt-driven commands in favour of screen windows. The sound differs as they use different chips.

The Memotech's sound is generated by the SOUND command and is specified in the command's seven parameters. These parameters include the channel number, the sound's frequency, volume and length. You can also specify the degree by which the volume and frequency will rise and fall. The

*'A Noddy program is a collection of pages that contain either data or programs. A data page is easy to create and once you've given it a title you're free to type any data you want, be it an address, recipe or menu.'*

example, a page of instructions or help screens.

The next built-in feature will appeal to users at the other end of the computing spectrum, as it's an assembler/disassembler package.

You enter the assembler from Basic by simply typing ASSEM. Once in you are free to enter insert and delete assembly programs; CLS then returns you to Basic and assembles the code. The assembler is accompanied by a monitor, or front panel, which allows the user to inspect, edit and move blocks of memory. With the monitor you can also follow the contents of the machine's registers while a program is running. This will have Z80 machine code freaks champing at the bit, but the rest of us will be content with MTX Basic.

The RS128 relies on the Texas Instruments TMS 9918 chip for its graphics facilities, so in order to appreciate the machine's Basic graphics capabilities it's necessary to understand the workings of the chip.

The picture displayed on the screen is created from a sandwich of 35 display planes, the first 32 of which are the sprite planes where a single sprite roams. These sprites are usually  $8 \times 8$  pixels square, although they can be  $16 \times 16$  or even  $32 \times 32$ . Positioned behind the sprite planes are the multicolour or pattern plane, the backdrop plane and the external video or border plane.

Any fixed pattern is drawn onto the pattern plane which in high resolution mode is split into  $256 \times 192$  pixels, therefore quite complex graphics can

pattern and backdrop planes, which are exactly what you see on the screen. You, therefore, see the pattern and backdrop planes overlaid by whatever section of the sprite planes you've selected with the 'VIEW' command. If there's any overlap between the sprites on different planes, precedence is given to the upper ones.

Surprisingly, all this is controlled by a handful of Basic commands. The patterns or shapes of the sprites are defined using the GENPAT command which forms a pattern table. Any of these patterns can be used by each sprite by substituting the correct number into the SPRITE command, which also defines each sprite's initial speed, position and colour. Sprites are moved by the MVSPR which tells a single sprite to move one step in a given direction.

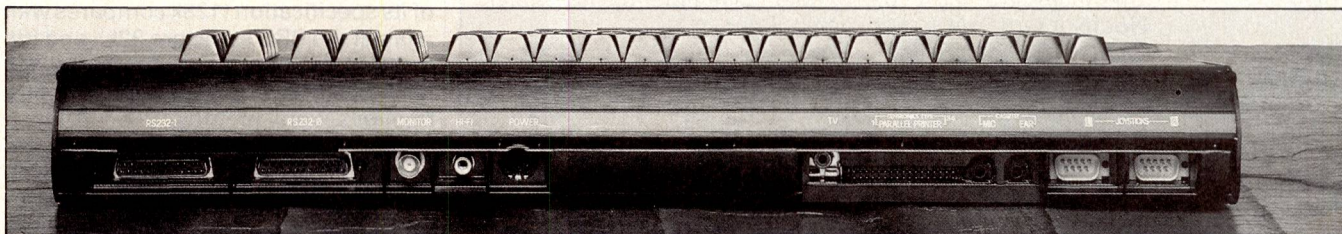
*'Both TV and composite monitor output are provided along with a hi-fi for channelling the sound through your amplifier. Power is fed into the computer via a din plug through an attractive power supply which has an on/off switch on one side.'*

The step size is set in the sprite command. The ADJSPR command is used to adjust a sprite's parameters while a program is running instead of repeating the SPRITE command.

The final sprite command is probably the most powerful and complicated, and can be used to set the size of sprites, their total number, the number of circling sprites and their speed, and to move sprites set distances. Sprites can

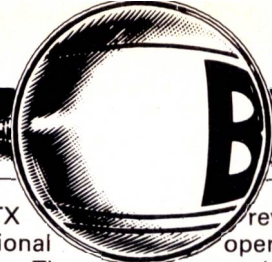
machine loads this information into a special area of memory called the sound buffer, which allows the computer to perform other tasks while the sound is playing. As this uses memory the sound buffer can be accurately dimensioned by the SBUF command.

An MTX Basic derivative is packaged with the FDX system and is logically called FDX Basic. This replaces the MBasic found on earlier FDX systems



*An impressive array of outputs and interfaces including two RS232 interfaces and a centronics printer port*





and is essentially MTX Basic with a few additional commands for disk access. These commands support both sequential and random access files which are compatible with CP/M and are self-explanatory.

## Applications software

Also included with the FDX system are a word processor called NewWord, and SuperCalc which requires no introduction.

NewWord is available for the RS128 in two forms: as a disk supplied with the FDX system, and as a plug-in ROM board costing £75. The ROM version contains fewer features than the disk version and uses cassettes for storage of documents. It will, however, form a reasonable compromise between users who want a word processor but haven't the funds to buy the disk system. In essence, NewWord is WordStar configured for use with the Memotech's keyboard. The transition has been successful as it forms a pleasant word processing unit.

Pascal and Logo are also available in ROM boards, although only the Pascal was available for evaluation. It was written for Memotech by Hisoft, and as you can see from the Pascal Benchmarks it's a good performer. Like the ROM-based NewWord it uses cassettes for storage, but must still be considered an essential buy for Memotech owners wishing to experiment with this powerful language.

Other software will be plentiful both in disk and cassette form if early indications are proven reliable. A catalogue enclosed with the machine shows a healthy list of about 50 titles including business, educational and games programs. The games include some titles that have been successful on other machines, such as the Level 9 adventures and titles from Ocean and Lothlorien.

As the RS128 becomes a fully-fledged CP/M machine with the addition of the FDX system, it will soon be supported by a glut of CP/M packages.

## Documentation

Three manuals were provided with the

review machine: the Basic tutor operator's guide, the FDX system manual, and the Hisoft Pascal user's guide. The Pascal manual is, and is meant to be, a pure reference guide to be used by existing Pascal users, and directs beginners to a number of books referenced at the back. The other two manuals aim to provide tuition as well as being reference works for experienced users.

The Basic tutor manual takes the user from initial setting up on to the intricacies of MTX Basic, Noddy and the built-in assembler. At each stage in the tutorial section there are enough examples to get users happily tapping away at the keyboard; at every stage you are urged to experiment with the commands you have just learnt. It's left to experimentation to discover some of the features of the machine. For example, as in Acorn computers, keywords can be abbreviated with a full stop, as the Basic takes this as a keyword and searches through its list until it finds one that starts with the letter(s) before the full stop. This is a useful feature which greatly speeds up programming, but no mention of this is made in the manual.

The back of the manual includes a variety of technical information which will keep techno buffs happy for weeks. This is fine, but there seemed to be an unbridged gulf between the tutorial section and the technical details. The same problem exists with the FDX manual which contains sections on setting up, using NewWord, SuperCalc and FDX Basic, and the technical section.

The manual is supplied in a ring binder which folds into a stand for easy use at the keyboard. A nice final touch is the disk holders, which are in the front of the manual and ensure that the disks don't stray too far from the machine.

## Prices

The Memotech RS128 costs £399 and as such is a direct price competitor to the BBC B, Advance 86 and Sinclair QL. The FDX disk system which converts into a fully-fledged CP/M system retails for £870, setting the total cost of the CP/M system at £1269. The silicon disks cost

## Benchmarks

| Pascal          |      |
|-----------------|------|
| Magnifier       | 0.3  |
| Forloop         | 3.0  |
| Whileloop       | 4.6  |
| Repeatloop      | 4.1  |
| Literal assign  | 3.7  |
| Memory access   | 3.8  |
| Real arithmetic | 15.6 |
| Real algebra    | 16.1 |
| Vector          | 8.7  |
| Equalif         | 6.6  |
| Unequalif       | 6.3  |
| Non-parameters  | 3.1  |
| Value           | 3.9  |
| Reference       | 4.0  |
| Maths           | 6.9  |

| Basic |      |
|-------|------|
| BM1   | 1.9  |
| BM2   | 5.3  |
| BM3   | 11.7 |
| BM4   | 11.4 |
| BM5   | 13.3 |
| BM6   | 22.6 |
| BM7   | 40.8 |
| BM8   | 43.7 |

**All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.**

£385 extra.

The Pascal ROM will cost around £50, but the ROM version of NewWord is more expensive at £75.

## Conclusion

The Memotech RS128 will be a very tempting prospect for anyone buying a home computer with a view to future expansion. The basic unit has a lot to offer with its 128k of memory, powerful graphics facilities, Noddy and the assembler. Add to this the FDX system and you have a powerful CP/M disk system complete with silicon disk for a competitive £1600. This also gives users access to the plentiful supply of CP/M packages.

This mirrors the facilities offered by the Advance, which provides users with IBM compatibility as opposed to CP/M. However, I feel that the RS128 has more appeal because of the quality of its construction and ease of use: for example, the keyboard is well suited for business use.

The RS128 may also convert some potential BBC and QL buyers by virtue of its specification (128k compares well against the BBC's meagre 32k), and the fact that its younger predecessors, the MTX 500 and 512, have operated bug free for several months.

The RS128 offers a total home computer package providing a wide range of games and educational programs, to a full CP/M system offering a formidable array of business packages.

**END**

## Technical specifications

|             |                                                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------|
| CPU:        | Z80A processor running at 4MHz                                                                                                   |
| ROM:        | 24k including MTX Basic, Z80 assembler/disassembler, Noddy interactive screen manipulator                                        |
| RAM:        | 128k + 16k video RAM                                                                                                             |
| Display:    | Text 24 lines of 40 characters. High-res 192 × 256 pixels. 16 colours, 32 sprites                                                |
| Sound:      | Four channels via TV or hi-fi output                                                                                             |
| I/O:        | 2400 baud cassette port, two RS232 ports, centronics printer port, two standard joystick ports, TV and composite monitor output. |
| Dimensions: | 70mm × 92mm × 110mm                                                                                                              |
| Weight:     | 1kg                                                                                                                              |



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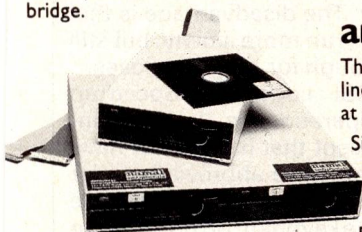
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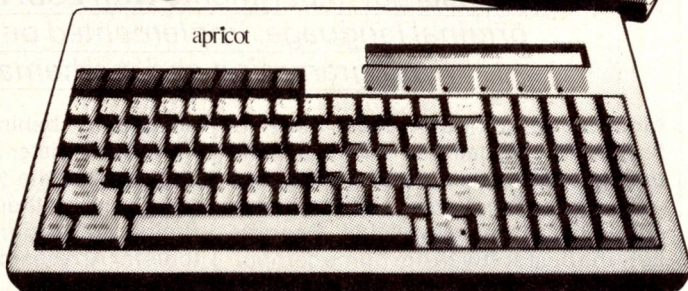
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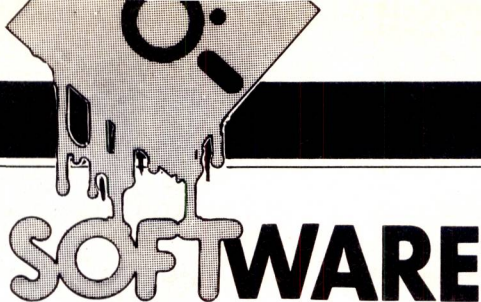
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SOFTWARE

# Lesson in Logo

*Mike Liardet experiments with LCSi Logo, a Sinclair-marketed version of the original language. Implemented on a 48k Spectrum it is designed to teach programming and mathematical skills to people of all ages.*

Most home computer users hope to find some educational value in their machine, but can easily become bored with the rather limited role-learning software currently available. Regrettably the best software for home computers is for games; but while games software is undeniably entertaining, most of it provides about as much mental exercise as a pin-ball machine.

Unlike Basic, Logo has been developed with the premise that learning should be easy and *fun*, and that anyone having fun will learn much more rapidly. We all become literate, not by reading Shakespeare, but with books that are easy and enjoyable. The same should hold true for computer literacy, and Logo is certainly a major step in the right direction.

But it would be unfair to cast Logo as the programming language equivalent of Noddy and Big Ears — it's much broader than that. It can be used at the Noddy level but is also sufficiently interesting for adults to use, and can subsequently exercise computer literacy skills right up to, say, *Brighton Rock* level.

Logo is a spin-off product from Artificial Intelligence (AI) research, and was devised by Seymour Papert at the Massachusetts Institute of Technology. Other well-known Artificial Intelligence languages include Lisp and Prolog. Some of the list processing features originally designed for Lisp have found their way into Logo, but the whole

philosophy behind Logo is different from its AI sister languages: whereas Logo makes the learning of programming and mathematics fun, Lisp and Prolog are designed as sophisticated tools for AI research.

## Implementation

At £39.95 LCSi's (Logo Computer Systems Inc) Logo may seem rather pricey for Spectrum software, but it's a very comprehensive and well-presented package. It comprises two spiral-bound manuals, a reference card and an audio cassette, all elegantly housed in a library box. The first manual is a tutorial, the second is for reference.

The software is compatible with Sinclair microdrives but must be loaded from cassette (seasoned Spectrum users will be used to doing this). The tutorial manual gives comprehensive instructions on what to do, including instructions for connecting up a Spectrum. In general the Logo documentation is completely self-contained, and it shouldn't be necessary to consult other Spectrum documentation at any time during a Logo session. The tape takes just over four minutes to load, with some graphics onscreen to entertain you while you wait.

Like Basic (and other languages — Lisp, Forth and Prolog), Logo is interpretative. This means that you can enter commands and programs directly at the keyboard and they are executed or

used immediately; the advantage being that if anything is wrong you'll quickly find out and be able to correct it immediately. The disadvantage is that the programs run more slowly, but still quite fast enough for most purposes.

Under LCSi Logo the Spectrum keyboard operation is largely unchanged, except that it does not have the single keystroke abbreviations for keywords: most of the Basic keywords marked on the keyboard do not apply to Logo. It does, however, recognise two-letter abbreviations in some cases (for example, 'FD 50' is the same as 'FORWARD 50').

## Drawing

An interesting option and the ideal way to introduce Logo is with a 'turtle', a motorised plexiglass creature trailing a pen and connected to the computer. Under keyboard control the turtle can crawl around the floor leaving a trail behind it. For example:

FORWARD 50

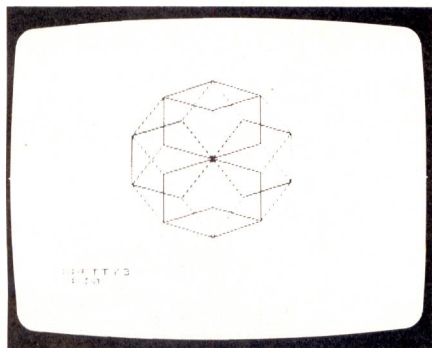
will cause the turtle to crawl forward 50 units leaving a straight line behind.

Then typing:

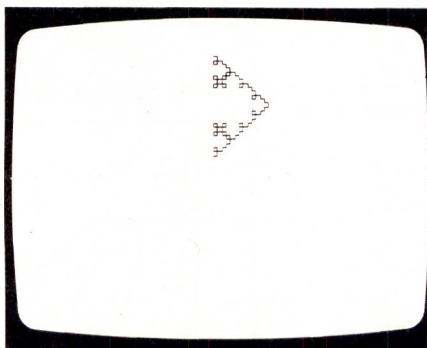
RIGHT 90

will cause it to turn 90 degrees to the right and a further FORWARD will draw a line at right-angles to the first, and so on.

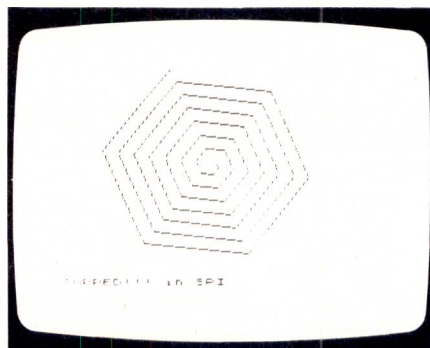
This turtle has obvious appeal for younger users, but does have the disadvantage of being slower and less precise than screen graphics. It also



Just a few commands to do this!



Drawing in Logo can be recursive



Parameters give different results



represents an added expense.

Most Logo users might prefer to forgo the expense, and make the small mental leap needed to work with a virtual turtle instead. With a virtual turtle the screen display shows a plan of the turtle's floor, with the turtle in the middle represented as an arrow. The arrow can be turned by commands such as RIGHT, and moved forward by using FORWARD. Following FORWARD, a line is left behind on the display. All the commands and effects are identical to a genuine turtle, so anyone used to the real thing can quickly get to grips with it.

The virtual turtle can be set to work immediately. Type:

```
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
```

and a square appears before your very eyes, with the turtle back where it started and pointing the same way (you see each side of the square appear as each line is typed). It's also interesting to note that LCSi Logo automatically selects graphics display instead of text as soon as the first line is typed. In text mode the entire Spectrum screen is used for text, but in graphics mode only the bottom two lines show text: the rest of the display is devoted to the turtle's floor. An added refinement from LCSi is that you should see a square and not a rectangle on your screen, due to the software having built-in compensation for your display's aspect ratio. If you have a peculiar TV you can tune this ratio with a Logo command until the display looks right.

To draw another square later, or for any other favoured sequence of commands, you must retype the above sequence again. This can get quite tedious, so Logo provides a facility for setting up any sequence of commands as a named procedure which is automatically executed every time you type the name:

```
TO SQUARE
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
FORWARD 30 RIGHT 90
END
```

After typing this no square is drawn, but the four lines to draw a square can be invoked at any time by typing the word SQUARE. This procedure TO

SQUARE can also be used by other procedures. For example:

```
TO SQUARESTAR
REPEAT 12 [SQUARE RIGHT 30]
END
```

Typing SQUARESTAR produces the display in Fig 1 — a sequence of 12 squares each rotated 30 degrees round the previous one.

Logo is really designed to get you started with graphics as soon as possible (the LCSi tutorial manual introduces graphics as early as page five). Graphics is much more interesting and motivating than generating tables of numbers, but is just as mentally stimulating.

LCSi Logo has many more graphics facilities. The graphics screen can be printed on the Spectrum printer and the 'pen' set into different modes: rub-out, pen-up, pen-down and reverse. Pen-up allows the turtle to move without affecting the display, pen-down draws normally, rub-out does just that, and reverse interchanges black and white. There's also a choice of eight colours for both background and pen, and 34 turtle operations in total.

### List processing

Logo's list processing facilities open the door to all kinds of interesting projects, and it can be argued that a new user will find lists a lot easier to handle than the nearest Basic equivalent — the array. In fact LCSi Logo does not have an array facility, so lists must be used instead.

A Logo list is a sequence of names, numbers or further lists enclosed in square parentheses. They can be manipulated in much the same way as Lisp lists but use more intuitive names for operators and, moreover, Logo does not suffer the confusing excess of parentheses for which Lisp is notorious.

```
FIRST [PCW ARTICLES [LISP LOGO]]
returns PCW
BUTFIRST [PCW ARTICLES
[LISP LOGO]] returns
[ARTICLES
[LISP LOGO]]
FPUT "GOOD [PCW ARTICLES
[LISP LOGO]] returns
[GOOD PCW ARTICLES
[LISP LOGO]]
```

and other commands like LAST and BUTLAST have an equally obvious effect. (FPUT is an abbreviation for 'first

put').

LCSi Logo doesn't provide quite as many list operations as Lisp. Notable omissions include RPLACA and RPLACD, which enable parts of an existing list to be overwritten ('RPLAC' means 'replaced' — typical Lisp obtuseness). Possibly this omission is intentional, as these so-called 'side-effect operators' have always been a controversial issue, at least in AI circles.

### Arithmetic and variables

LCSi Logo provides a number of arithmetic functions which can handle both integers and floating point. The syntax for arithmetic expressions is much like other languages — and *not* like Lisp. There are, however, one or two surprising omissions such as exponentiation (for example,  $2^4 = 16$ ) and logarithms. The trigonometry functions operate, like the turtle, on degree quantities and not radians.

Like most languages Logo allows for variables, which can be used to store intermediate results, but in some respects I found Logo's use of variables a little confusing. The translation of the Basic statement:

```
LET X = Y + 3
```

into Logo is:

```
MAKE "X :Y + 3
```

which seems less intuitive.

Each word used in a command line can be preceded by a colon, quotation, or nothing. For example, applying the Logo PRINT procedure to each of these three possibilities for the word X:

```
PRINT "X echoes just X on the screen.
```

```
PRINT :X prints the value of X.
```

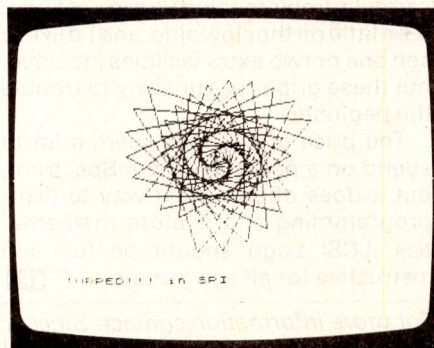
```
PRINT X is an error, since Logo
attempts to execute a (non-
existent) procedure X.
```

LCSi Logo programs are built up out of simple procedures. Procedures can have parameters, thus the SQUARE procedure can be generalised to draw any size of square by the introduction of a :SIZE parameter:

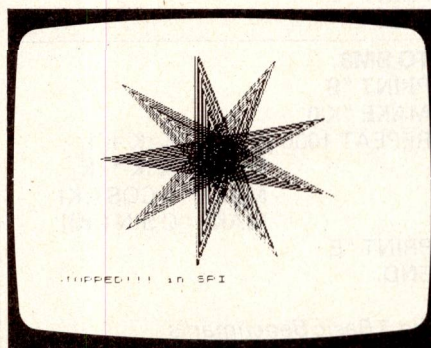
```
TO SIZESQUARE :SIZE
FORWARD :SIZE RIGHT 90
FORWARD :SIZE RIGHT 90
FORWARD :SIZE RIGHT 90
FORWARD :SIZE RIGHT 90
END
```

SIZESQUARE 30 draws a square of side 30

SIZESQUARE 40 draws a square of side 40, and so on.



Spiral with 125° turn



Spiral with 160° turn

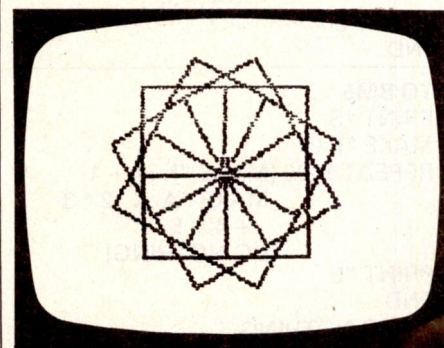


Fig 1 A sequence of 12 squares





LCSI Logo has a very poor supply of conditional operators—just two in fact. REPEAT is used to repeat a list of instructions a number of times, and IF is used to perform conditional evaluation.

```
TO DOHIL
SHOWTURTLE
CLEARSCREEN
PENUP
SETX 100
SETY -88
PENDOWN
HILBERT 3 6 1
END

TO HILBERT :SIZE :LEVEL :PARITY
IF :LEVEL = 0 [STOP]
LEFT :PARITY * 90
HILBERT :SIZE :LEVEL - 1
  (- :PARITY)
FORWARD :SIZE
RIGHT :PARITY * 90
HILBERT :SIZE :LEVEL - 1 :PARITY
FORWARD :SIZE
HILBERT :SIZE :LEVEL - 1 :PARITY
RIGHT :PARITY * 90
FORWARD :SIZE
HILBERT :SIZE :LEVEL - 1
  (- :PARITY)
LEFT :PARITY * 90
END
```

Fig 2 The Hilbert Benchmark

```
TO BM1
PRINT "S
REPEAT 1000 []
PRINT "E
END

TO BM2
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1]
PRINT "E
END

TO BM3
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K / :K * :K
              + :K - :K]
PRINT "E
END

TO BM4
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K / 2 * 3
              + 4 - 5]
PRINT "E
END

TO BM5
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K / 2 * 3
              + 4 - 5
              DO.NOTHING]
PRINT "E
END
TO DO.NOTHING
END
```

For example:  
REPEAT 3 [MAKE "X BUTFIRST :X]  
knocks the first three elements off the list X. And:  
IF :Y < 0 [PR "ERROR] [PR SQRT :Y]  
prints the square root of Y unless it's negative, in which case it prints ERROR.

There is a complete absence of FOR loops, DO-WHILEs, REPEAT-UNTILs, and so on—even the infamous GOTO is banned. It can be argued that these features are unnecessary or undesirable for the novice, but their omission does make complex tasks more difficult to program.

Logo supports recursion, which compensates somewhat for its dearth of conditional constructs. The Hilbert Benchmark (Fig 2) uses recursion, since it calls itself.

As procedures become more complex, an editor is necessary to create and correct them. Small simple procedures can be typed in at the keyboard and corrected by retyping from scratch, but in general most procedures should

be worked on through the editor.

The editor is started by typing:  
EDIT "PROCNAME  
which enables the procedure PROCNAME to be edited. The screen clears and the current definition of PROCNAME is displayed. This can be freely modified by moving the cursor to the desired position and typing new text or deleting old. A couple of keystrokes finish the edit session and the new definition of the procedure is duly recorded.

There are no special sophistications in the editor and it can feel a little sluggish at times, but it's certainly adequate for the task, and preferable to the type of editing used by most versions of Basic.

Procedures can be saved, selectively if necessary, onto named files either on cassette or microdrive. It took just 25 seconds to save the eight Benchmarks (Fig 3) onto cassette. It's also possible to save variables, and since variables can contain lengthy lists, small databases can be readily saved in this fashion.

In order to test the performance of LCSI Logo, the eight Benchmarks used for testing Basic were translated into Logo (Fig 3) and a new Benchmark (Fig 2) introduced, specifically to test its graphics capabilities.

Not all the Benchmarks could be precisely translated into Logo, but the translation was close enough for comparisons to be made (Fig 4).

```
TO BM6
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K / 2 * 3
              + 4 - 5
              DO.NOTHING
              MAKE "M []
              REPEAT 5 []]
PRINT "E
END

TO BM7
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K / 2 * 3
              + 4 - 5
              DO.NOTHING
              MAKE "M [] REPEAT 5
              [MAKE "M FPUT :
                A :M]]
PRINT "E
END

TO BM8
PRINT "S
MAKE "K 0
REPEAT 1000 [MAKE "K :K + 1
              MAKE "A :K * :K
              MAKE "B COS (:K)
              MAKE "C SIN (:K)]
PRINT "E
END
```

Fig 3 Basic Benchmarks  
translated into LCSI Logo

|         | LCSI<br>Logo | Spectrum<br>Basic |
|---------|--------------|-------------------|
| BM1     | 3            | 4.8               |
| BM2     | 90           | 8.7               |
| BM3     | 230          | 21.1              |
| BM4     | 290          | 20.4              |
| BM5     | 300          | 24.0              |
| BM6     | 360          | 55.3              |
| BM7     | 550          | 80.7              |
| BM8     | 670          | 253.0             |
| Hilbert | 1143         |                   |

**All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.**

Fig 4 Benchmark results

## Conclusion

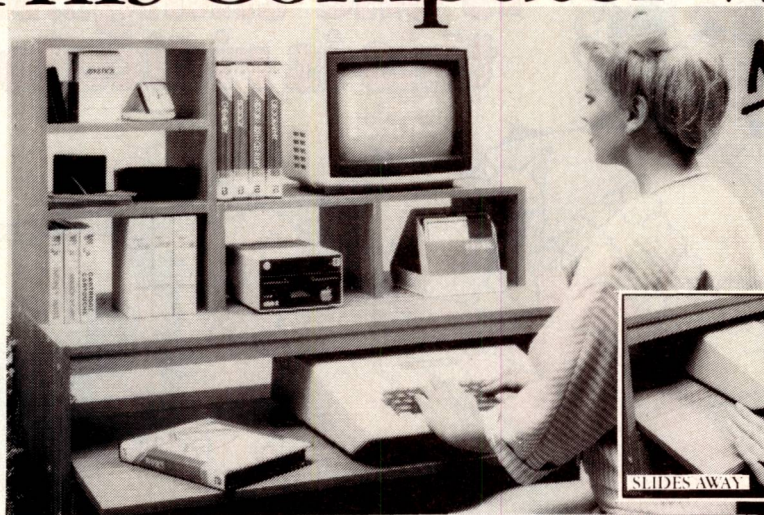
LCSI Logo is a well-presented and carefully implemented version of Logo. It's a little on the slow side, and I'd like to see one or two extra facilities included, but these gripes are unlikely to trouble the beginner.

The price of £40 may seem a lot to spend on a package for the Spectrum, but it does offer a great way to learn programming and explore mathematics. LCSI Logo should be fun and instructive for all age groups. **END**

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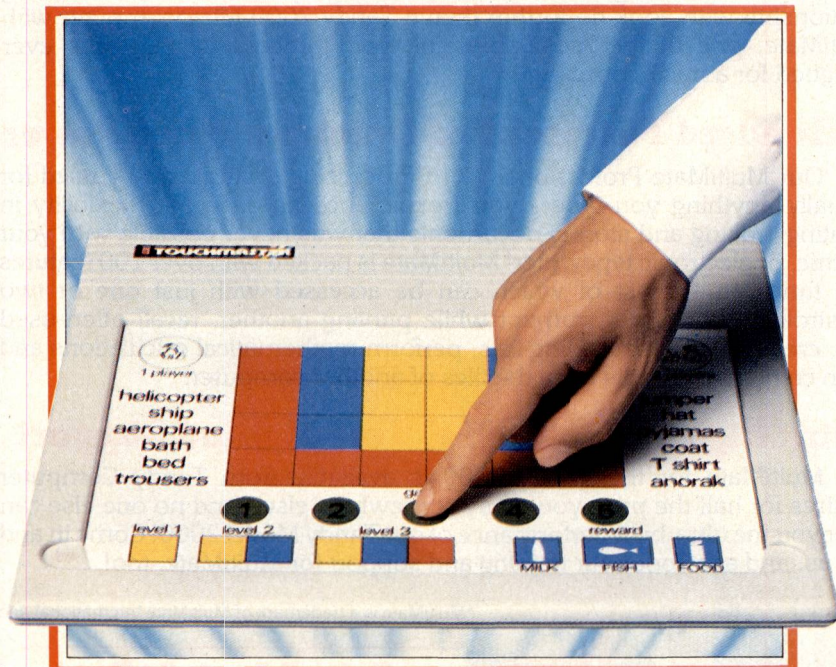
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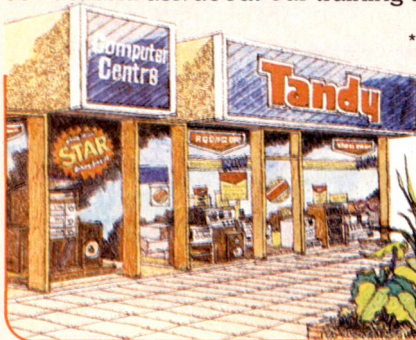
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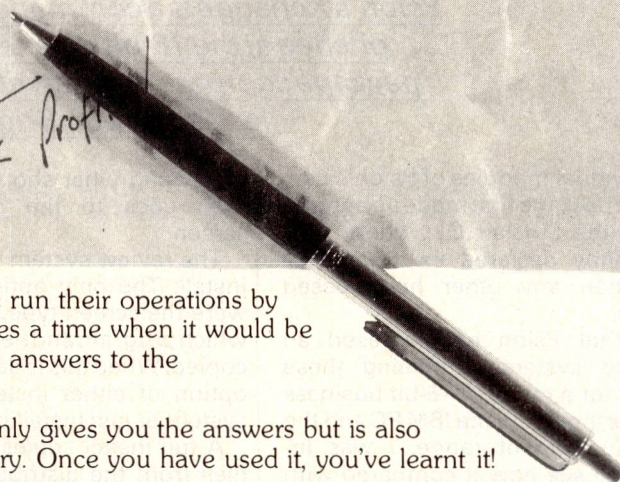
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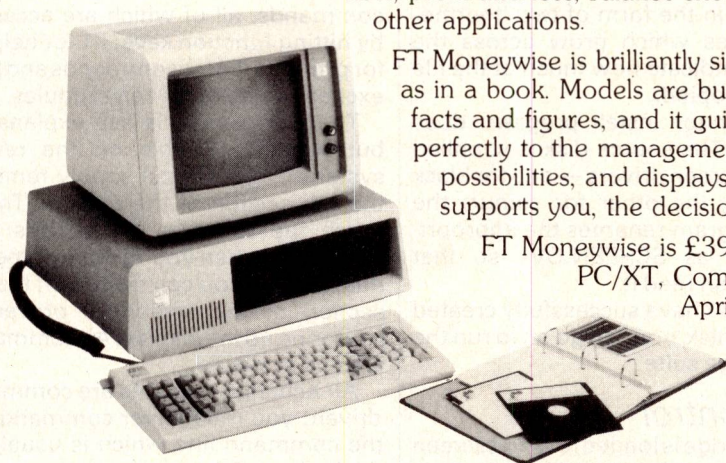
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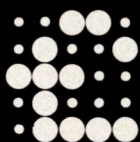
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The individual modules of Psion's new Xchange package first made an appearance on the Sinclair QL, where they were rightly declared as more advanced than any other home-based software.

The most impressive aspect of the Psion software is the way that it's packaged. Instead of the usual IBM-style binder and box approach, each Xchange module is housed in a tough plastic case. To get inside you lift a catch and the top hinges up to reveal the documentation, which can be flipped up in the same way that you would use a flip chart.

All the modules were included in the review system which was supplied on just two diskettes: one, labelled 'Source', contained all the program files and the other, labelled 'Utilities', contained the help files and the printer driver routines.

Before you can run Xchange for the first time you have to install it for your machine. The review system was designed for an IBM PC, so I had to tell it that my PC had a colour display and copy the files from the distribution disk to the work disk.

explaining what should be done, and then goes to the main command screen.

A full install copies the appropriate files from the distribution disk to the work disk. Install takes a long time to do this, but at least there is some compensation in the form of two 'thermometer' lines which grow across the screen to indicate how much of the file has been copied.

When you have successfully created a working disk, you can go on to run the full Xchange suite.

screen sets the pattern for the rest of the system. It's divided up into three main areas — top, middle and bottom: the top section displays all the commands available at this level; the middle displays the name of each installed Xchange module along with the name of all currently active jobs, and also displays the current date and printer status; and the bottom forms the direct command line to enter Xchange commands.

The help option is self-explanatory but wasn't available on the review system. F2 (prompts) simply removes the top section of the display. This is much the same as WordStar's help screens — when you're accustomed to the package you can switch off the top section of the screen to prevent it cluttering up the display. All commands are still available.

|                                  |                                       |                          |
|----------------------------------|---------------------------------------|--------------------------|
| <b>PRESS</b>                     | <b>OPTIONAL TASKS:</b>                | <b>PRESS</b>             |
| <b>ENTER</b>                     | Use any key to select the task.       | <b>DATE</b>              |
| <b>PRESS</b>                     | <b>Press ENTER to start the task.</b> | <b>DATA</b>              |
| <b>TASK TABLE FILE USED</b>      |                                       | <b>PRINTED STATUS</b>    |
| <b>DELETE</b> - <b>DEL</b>       | <b>YES</b>                            | <b>no point actioned</b> |
| <b>ENTER</b> - <b>PREPARE</b>    | <b>NO</b>                             |                          |
| <b>DELETE</b> - <b>PREPARE</b>   | <b>NO</b>                             |                          |
| <b>ARCHIVE</b> - <b>NOTED</b>    | <b>YES</b>                            |                          |
| <b>ARCHIVE</b> - <b>NEW TASK</b> | <b>NO</b>                             |                          |
| <b>DELETE</b> - <b>NEW TASK</b>  | <b>NO</b>                             |                          |
| <b>ARCHIVE</b> - <b>NEW TASK</b> | <b>NO</b>                             |                          |
| <b>DELETE</b> - <b>NEW TASK</b>  | <b>NO</b>                             |                          |
| <b>DATE</b> - <b>DATE</b>        | <b>DATE</b>                           |                          |
| <b>DATA</b> - <b>DATA</b>        | <b>DATA</b>                           |                          |
|                                  |                                       | <b>01/01/1980</b>        |

[illegible]

180 PCW



to the package it can be difficult to remember all the available commands, but pressing F3 (commands) provides a complete list which is displayed in the top section of the screen.

Commands are usually issued by typing the first letter of the required command. The only exception is Archive, the database, where all commands have to be typed in full. If you want to get out of a command, ESCape will usually do the trick.

There are a total of 12 valid task control commands at the top level: BACKUP, CONTINUE, DELETE, LIST, NEW, OUTPUT, PRINTERS, QUIT, RE-NAME, SET, TSL and XCHANGE. Most are self-explanatory; CONTINUE is a way of restarting a frozen Xchange job and LIST is a disk directory program. In addition to producing a list of all the files on the disk LIST accepts wildcards, so LIST \*.DOC will only display document files.

In theory, one of the nicer features of Xchange is its ability to print documents in the background while you get on with another task, which is a great time saver. This facility is activated by the OUTPUT command followed by the filename of the document to be printed, but on my version something was wrong. As soon as I tried to print and do something else at the same time, everything slowed down to such an extent that the system was virtually useless. Psion says that it's working on this.

All output to a printer from Xchange is via a 'printer driver'. This effectively generates all the appropriate control codes and means that the system can be used with a wide range of printers. The review system was supplied with drivers for Epson and Diablo printers, but I could have designed my own driver using the PEDIT utility. This produces a disk file which can then be used by Xchange; you can apparently install different printer drivers by using the PRINTERS command. When I tried this on the review machine it completely ignored me. Psion is working on this too.

The TSL (Task Sequencing Language) is Psion's version of the macro-type facility found on many modern

packages. Using TSL you can store a sequence of key presses, do some rudimentary programming to obtain keyboard characters, and loop a sequence of instructions. This kind of facility is handy for direct access to a much used function, or for building small turnkey systems.

### Virtual memory manager

The major difference between the 'big' version of Xchange and that supplied on the Sinclair QL is the integration of all the packages, and the use of a virtual memory manager.

Virtual memory managers use disks in much the same way that other programs use RAM. The advantage is

written out to disk. This system tries to ensure that frequently used data can be reached reasonably quickly.

The great advantage of having this amount of memory available is that you can hold more than one job in memory (not necessarily RAM) at the same time.

The review system allowed up to eight jobs to be open at any one time. If you're in the middle of a job and decide that you want to do something else, you simply hit function key 6 and the job is frozen, and you are returned to the task control menu. You can then start up another job, do that, hit F6 again, go back into your old job and carry on from where you left off.

The only restriction is that unlike

*'The great advantage of having this amount of memory available is that you can hold more than one job in memory (not necessarily RAM) at the same time. The review system allowed up to eight jobs to be open at any one time.'*

that the program is not limited by the amount of RAM available for storage—if the RAM is full, it puts the data on the disk. The disadvantage of this approach is that it takes a great deal longer to access a disk than it does to get at RAM. To avoid this problem, Xchange's virtual memory manager is designed to handle three distinct types of memory: segment one, segment two and disk.

Segment one is the primary storage area and is made up of a 64k chunk of RAM. The size of segment two is calculated by taking your machine's RAM and subtracting the 64k taken by segment one: on a 256k machine segment two would be 192k. The slowest memory available to the memory manager is the disk drive.

When Xchange is running, the memory manager is constantly shuffling blocks of data between the three areas of memory. When a block is needed, it's located and moved up to segment one. Blocks are relegated to segment two and finally to disk on a 'least recently used' basis: first it's moved from segment one to segment two and if it still hasn't been used for some time, it's

Concurrent CP/M, for example, when you leave a job it's frozen—it doesn't carry on processing.

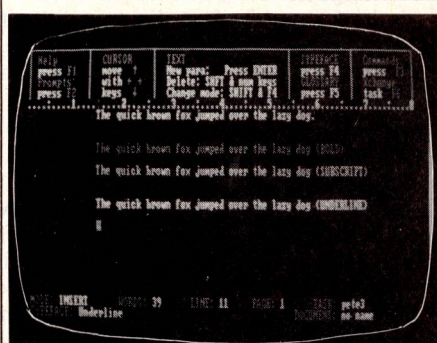
### Speed

The speed with which you can switch from job to job is very much dependent on the amount of RAM you have. In general, the more RAM your machine has the larger segment two is, so the faster your system runs. However, Xchange's switching from module to module will never be as fast as Symphony's, because Psion decided to keep the program overlays permanently on disk rather than crowding RAM. This means that when you switch from module to module, there will be a small time delay as the overlay is loaded from disk.

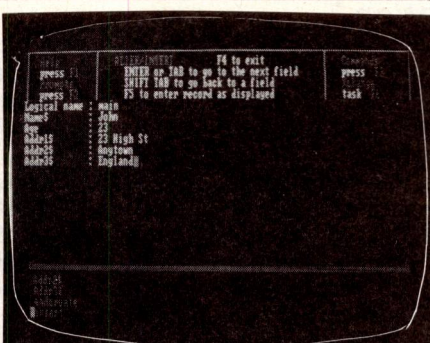
I was very interested to see how fast Xchange was at switching from module to module. I tried the program on three different machines: an Olivetti M24 with 256k of RAM, an IBM PC XT with 512k, and an IBM PC Portable with 256k. In theory, because the XT had more RAM it should have been the fastest at switching between jobs. In practice, they all worked at the same speed—slow. I couldn't understand this until I phoned Psion and discovered that the version I was supplied with locked out the whole of segment two of RAM. It didn't matter how much RAM the machine had, Xchange just used 64k and sent everything else straight to disk. Psion is working on this.

Facilities for moving data from one job to another are straightforward. To transfer data between two jobs which are already open on the system, hit function key 6 from the task control menu and Xchange will do most of the hard work for you.

Let's assume that you want to transfer data from the Abacus spreadsheet to the Easel graphics package, and that



*The Quill word processor is not particularly impressive. The main typing area is cramped and restrictive but general editing is OK*



*The Archive database has an excellent programming language and its commands are similar to many Basic keywords*





both jobs are open. When you hit F6 the system prompts for copy from name, and copy to name. It then displays the spreadsheet which asks for the range you want to copy from, and creates a temporary file for the transferred data. Next it goes into the word processor, gives itself an 'import' command and pulls in the data from the file. On my system this was all quite fun to watch, but slow.

If the job you want to copy to or from isn't open, you can manually create an export file and write to that; you can then load in the other job and read the data.

It isn't possible to move data from any job to any other because the data isn't always compatible. In the word processor, for example, you can only import data; you can't export because the data isn't structured.

## Modules

Xchange is made up of four different modules: Abacus the spreadsheet, Quill the word processor, Archive the database, and Easel the graphics package. Abacus and Easel on the Sinclair QL were reviewed in the September issue, so I'll take a look at the differences on the IBM PC version.

The main difference on the spreadsheet is that the IBM PC version allows up to 255 columns by 999 rows, making Abacus into a much more useful spreadsheet allowing very complex models to be built up. The IBM PC version of Easel suffers from having to be printed on the PC's limited resolution graphics screen. Psion says that it's working on a version compatible with the Hercules graphics board, but it won't be available 'for a while'.

The least impressive of the four Xchange packages is Quill. The screen

system then asks you to move the cursor to the start of the block to be copied and hit ENTER, then move to the end of the block and hit ENTER

*'A year or two ago command-driven databases were the norm, but now the trend is towards simple to use, more graphical databases which make it easy for Joe Average to sit down and bash out a database. Archive isn't so good in this area, but it's a great tool for building applications.'*

again. This is where you encounter the first problem: you can only move down one line at a time, so if you want to copy a large chunk of text you spend hours hitting the down arrow key. If you accidentally highlight a word, there's no way you can hit the left arrow key to remove it — you have to start again.

Assuming that you now have your block highlighted, you are then requested to move the cursor to where you want the text copied and press C (ENTER would have been a more logical choice, but it cancels the command). Finally, when you have copied the text you have to press ENTER yet again for confirmation that the job's been completed.

However, Quill is not all bad: it does have some powerful features, but unfortunately it's very annoying to use. My version was prone to crashing — I know it was a beta test version, but I hope Psion clears it up in time.

Those of you who read the QL Benchtest (PCW, June) will know that the Archive package is a very impres-

being made of PROCedures, WHILE . . . ENDWHILE, and so on. This all adds up to a system which looks enough like Basic to make a Basic programmer feel at home, but which has powerful enough features to allow very complex databases to be built up.

My only reservation about Archive is that it's command-driven. A year or two

ago command-driven databases were the norm, but now the trend is towards simple to use, more graphical databases which make it easy for Joe Average to sit down and bash out a database. Archive isn't so good in this area, but it's a great tool for building applications.

## Documentation

The documentation accompanying Xchange was very good. By some strange quirk I was given the Sirius documentation even though I had IBM PC software, but apart from that it was easy to follow and commendably short. Many packages these days are supplied with tons of documentation which no-one reads. In contrast, the Xchange documentation was brief and to the point without omitting vital information.

## Prices

The suite of four packages costs £495 and is available for the Apricot, Apricot XI, Sirius, IBM PC and IBM XT. Individually, each package costs £175, except Archive which costs £250. Prices exclude VAT. Apple Macintosh and DEC Rainbow versions are planned for autumn release.

## Conclusion

Xchange is OK but I couldn't get as excited about its features as I did with Symphony or Framework.

The review version wasn't at all reliable, mainly due to the fact that it was an early, heavily patched up beta test version.

Two of the modules — Abacus and Archive — are very good; the other two — Quill and Easel — are not so good. The overall integration was fairly basic, but it worked well enough. The user interface was fine except for niggling differences in the way identical operations are performed in the different packages. These things tend to annoy you after a while.

Xchange is competent, but it won't set the world on fire. **END**

*'The documentation accompanying Xchange was very good . . . many packages these days are supplied with tons of documentation which no-one reads. In contrast, the Xchange documentation was brief and to the point without omitting vital information.'*

is divided up into three main areas: the top section is the usual command area; the middle section is the typing area; and the bottom gives general information on line, page, word count, typeface, and so on.

The main typing area is rather cramped. You can only edit in the central eight lines of the display when the top section is switched on, although the text is visible either side of the editing area. General editing is OK, but the fun starts when you try any block operations.

Let's take the example of a block copy. First you hit F3 and C for copy. The

sive database. Like the rest of Xchange it's command-driven, but in this case you have to enter the commands in full rather than just typing the first letter.

Although Archive is easy to use, it has some powerful built-in features. Two of the most useful are the advantage of having more than one file open at a time, and the ability to have multiple indexes pointing at the same data file.

Archive's strong point is its programming language. All Archive's commands are very like many common Basic keywords, and some of the control structures are similar to a structured Basic with extensive use



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We make everything you'll ever need to get the most out of home computing: all the *hardware* and all the *software*. (And if you don't understand what that means, simply look under "H").

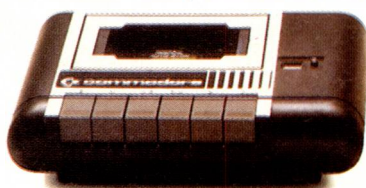
That's what these three pages are all about: explaining what computers are (without the scientific jargon), how they work (without any technical mumbo-jumbo), and how you can get more enjoyment out of them (without much difficulty).

**B**ASIC. Most home computers speak the same language. It's called BASIC. This is a friendly way of saying "Beginners All-Purpose Symbolic Instruction Code."

There are different kinds of BASIC and, like languages, some are a little easier to understand than others. Like, for instance, BASIC 3.5 in the *Commodore plus/4* and *Commodore 16* computers. **BOOKS** you can read: "Teach Yourself Computer Programming With The Commodore 64" and "Programmers Reference Guide."

**C**ASSETTE. Just as you keep your favourite TV programmes on video cassette, and your favourite music on audio cassette, you can keep your favourite computer programs on cassette too. You can buy pre-recorded programs in a shop, or you can write them yourself. Cassettes are just one form of program storage and playback - see also *Cartridges* and *Disk Drive*.

The Commodore 1530 and 1531 cassette units have been specifically designed to get the very best out of our computers, and provide consistently reliable results.



**CARTRIDGES.** These are programs that plug directly into the back of the computer itself.

**CPU** stands for **C**entral **P**rocessing **U**nit. This is the computer's "brain," and basically it's what does all the hard work.



**CHIP:** micro. A very complex electrical circuit that has been miniaturised in silicon. Unlike other home computer companies, Commodore manufacture their own chips, so first class quality can be maintained.

**D**ISK drive. A program storage system, like *cassettes*, but much faster. You can find the program you're looking for in seconds instead of minutes. Disks, which can be used again and again

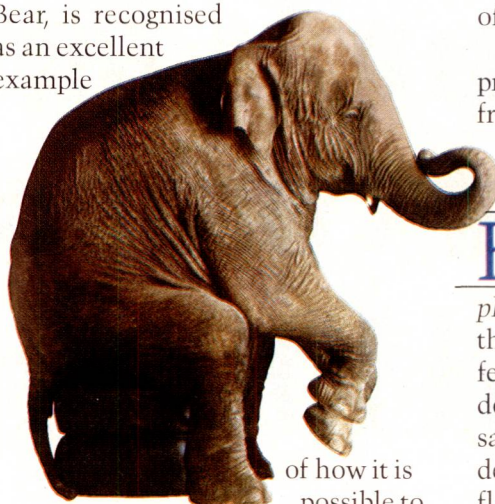
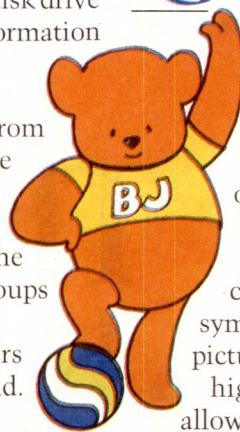
for recording or re-recording programs, are placed in the disk drive which then transfers the information or instructions to the *CPU*.

**E**DUATION software from Commodore. We are continually working with educationalists, improving our range of programs for the pre-school to "O" level age groups and beyond.

Many claim computers are an essential educational aid.

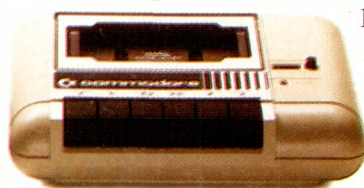
We tend to agree!

Our "Get Ready to Read" series, with a lovable character called B.J. The Bear, is recognised as an excellent example

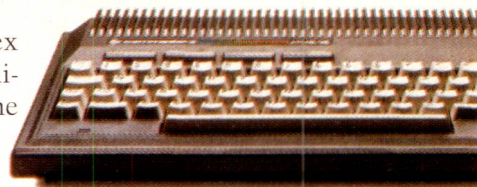


of how it is possible to develop reading and writing skills in pre-school children.

**ELEPHANT:** well-known symbol of the *Commodore 64*'s enormous 64K memory. And don't you forget it!



**F**OUR is for Commodore plus/4, our very latest home computer with four, very popular built-in programs: word processing, spread-sheet (financial planning), database (filing), and graphics.



It has an extensive 64K memo with an exceptionally large 60K available for use. The plus/4 com equipped with the Commodore BASIC 3.5 with over 75 programming commands.

Other features include comprehensive graphics, 121 colour and sound facilities.

**G**ORTEK and the Microchips is unique programming course for children of all ages, th links learning exercises with a space adventure story **GRAPHICS.**

The pictures and diagram on a *monitor* or TV screen, either high or low resolution.

All Commodore home computers have 66 graphics symbols to create low resolution pictures and diagrams, or high resolution modes that allow you to specify each pixel (or dot) on the screen.

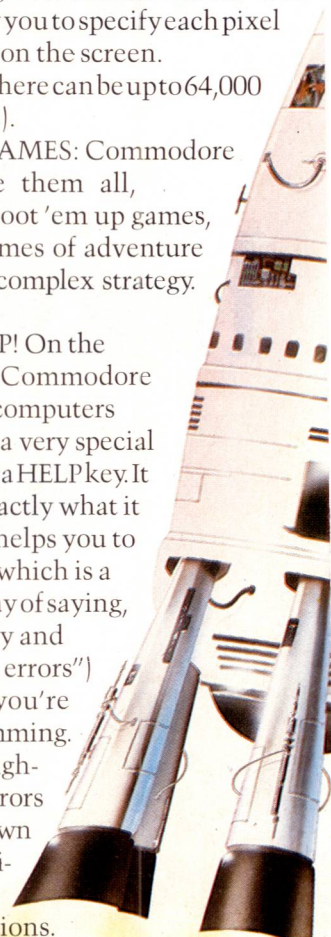
(There can be up to 64,000 of these).

**GAMES:** Commodore produce them all, from shoot 'em up games, to games of adventure and complex strategy.

**H**ELP! On the Commodore plus/4 computers there is a very special feature: a **HELP** key. It does exactly what it says: it helps you to debug (which is a flash way of saying, "identify and correct errors") when you're programming.

It highlights errors right down to individual instructions.

**HARDWARE,** The computer itself - you can touch it. Whereas software's a program you can only see or hear (on the monitor) when it's running in the computer.





**I**NTEGRAL software is software that's actually built into the computer, as on the Commodore plus/4, the very latest in home computing.

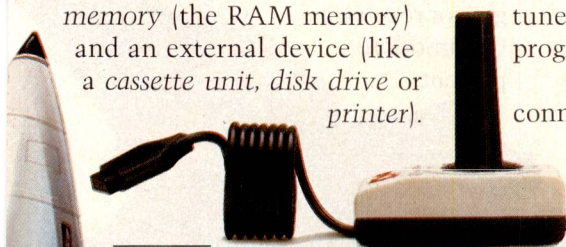
**INTRODUCTION** to BASIC. Just as you don't need to understand how a car works to be able to drive it, you don't have to understand how a computer works to be able to use one.

But you will definitely get more enjoyment out of it if you do have a basic knowledge of programming.

Which is why "Introduction to BASIC" has become the most popular software tutorial.

It comprises 2 cassettes and an easy-to-follow, step-by-step booklet.

**INPUT/output:** the part of the computer that allows data to be transferred between its own internal memory (the RAM memory) and an external device (like a cassette unit, disk drive or printer).



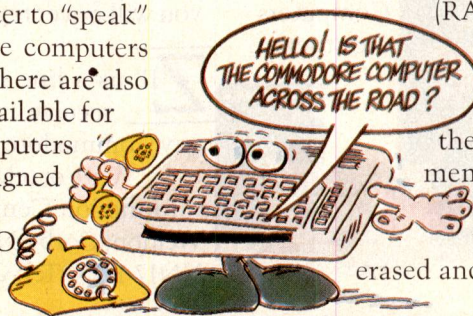
**J**OYSTICK and paddles. As well as improving speed and accuracy, these make games more real by putting the control of whatever it is on the screen directly into your hands.

**K**ILOBYTE is 1,024 bytes. So "K" stands for a unit of 1,024 or  $2^{10}$ . A 64K byte memory unit contains  $64 \times 2^{10}$  or 65,536 bytes of memory. And if you don't understand all that, don't worry.

All that's important is knowing you can run more complex programs through a computer with a large memory, than one with a small memory.

**L**ANGUAGE. This is a system of coding that can be understood by a computer. It allows you to "speak" to the computer, and for the computer to "speak" to you. Most home computers speak BASIC, but there are also other languages available for Commodore computers that have been designed for specific uses.

For example, LOGO and PILOT in education.



**M**ONITOR: this is the screen on which you can see what you've typed into the computer, and also what the computer is saying back to you. You can use an ordinary TV screen, but more preferable is a colour video monitor, like the Commodore 1701.

This is a special device that produces much higher resolution than a TV, and so offers superb reproduction and clarity.

On top of which it allows the rest of the family to stay tuned-in to their favourite TV programme while you're tuned-in to your favourite computer program.

MODEMS allow computers to connect via a telephone line to other computers systems. Commodore 64 modem owners can communicate with other owners, join systems like Prestel/Micronet and an exciting new system called Compunet, where quality software is available cheaply or even free.

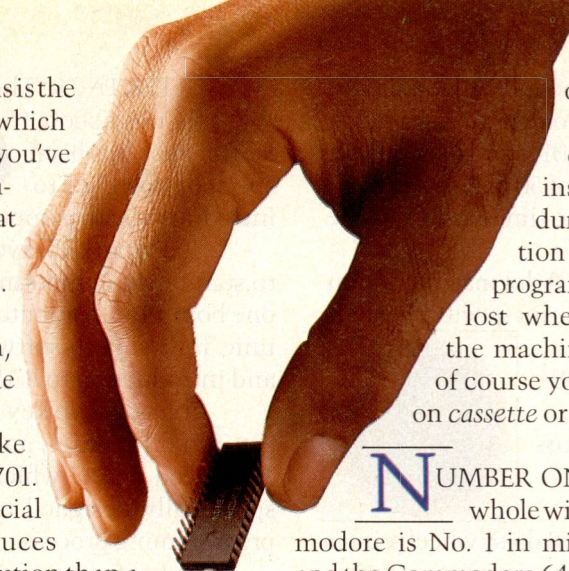


**MEMORY.** There are two basic types of memory: ROM and RAM.

Read Only Memory (ROM) is the computer's permanent built-in memory which tells the computer what to do. It doesn't disappear when the computer's switched off.

Random Access Memory (RAM), however, is for temporary storage.

It's the part of the computer's memory that's free for you to use. It can be erased and used over and



over again. It stores data and instructions during the execution of a computer program. These are lost when you switch the machine off - unless, of course you store them on cassette or disk.

**N**UMBER ONE. In the whole wide world, Commodore is No. 1 in microcomputers, and the Commodore 64's the No. 1 best seller.



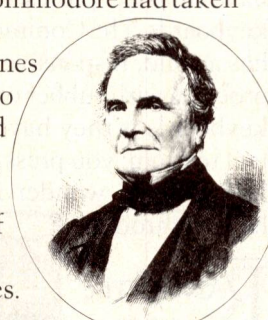
**O**RIGIN of the computer. In the 19th Century an Englishman, Charles Babbage, invented the first true computer. But his "Analytical Engine," was so ahead of its time, it turned out to be impossible to build!

The modern computer first appeared around the time of World War II. Britain's "Colossus" was vast, consumed vast amounts of electricity, required its own air-conditioned room, was unreliable and difficult to operate.

It had its limitations. Then came the amazing transistor... integrated circuits... and microcomputer.

The first desk top microcomputer in the world was the Commodore PET (a friendly name for Personal Electronic Transactor), in 1977.

In effect Commodore had taken hitherto huge, mysterious machines accessible only to eggheads, reduced the size and price, and put them into the hands of ordinary mortals in ordinary offices.



**P**ERIPHERALS. These are outside the main body of the computer, but are connected to it.

They perform a definite function, which is usually input or output.

**PRINTER:** One of the ways a computer can "speak" to us.

It means you can actually keep, on paper, the fruits of all your labour.

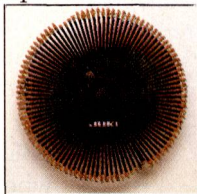


The Commodore range includes four printers and one printer plotter.

The MPS 801 dot matrix printer has a print speed of 50 characters per second (about five times as fast as the fastest secretary).

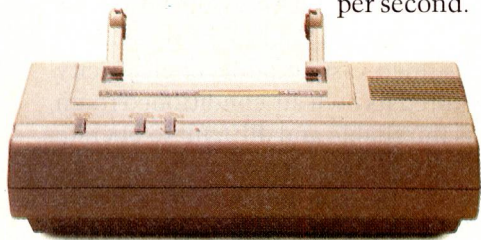
The MPS802 dot matrix friction feed printer has a print speed of 60 characters per second.

The MCS801 dot matrix colour printer has 7 colours and prints 38 characters per second.



The DPS1101 daisy wheel printer (called that because, surprise, surprise, the print wheel looks a bit like a daisy), produces superb quality print on all letters, reports and documents (the kind of quality one desperately requires on a letter to the bank manager). There's a range of alternative type faces available on additional print wheels. Speed: 18 characters per second.

And the 1520 printer plotter, (illustrated). This has 4 colours, and opens up a whole new world of graphic print-out ability. You can draw pictures, create graphic designs, plot graphs or construct bar and pie charts. Speed: 14 characters per second.



**Q**WERTY—the top 6 letters on a typewriter. Unlike lesser machines, all Commodore computers have full-size, professional typewriter keyboards. The Commodore keyboard has a solid, responsive feel to it. (The problem with rubber or membrane keyboards is they have a soft, spongy feel to them: you press a key and immediately wonder if the message has got through).

**R**ANGE. The range of Commodore software is enormous. There is something as they say, for everyone: educational, business, home and games.



**S**TARTER PACK. The Commodore 16 Starter Pack has been specially designed to introduce you to computing.

It contains everything you need to start home computing, complete in one box: a 16K computer, cassette unit, four superb software programs, and Introduction to BASIC Part 1.

It has a *Help* key in case you get into difficulties, and incorporates Advanced BASIC, which has been specifically designed to simplify the programming process.

Other features include: 4 cursor keys, 2 joystick ports, an astonishing 121 colours, plus excellent sound and graphics capabilities.

**T**UNES. Commodore make software to help you compose your very own music.

All our home computers have great sound and music capabilities.

**U**SER friendly. This is a program that explains itself as it goes along, or a computer that people can easily operate.

Every computer manufacturer now claims its products are "user friendly," but only Commodore really demonstrates it. For example, our *Help* key and use of Advanced BASIC.

**V**ERTICAL integration is not as complicated as it sounds. All it means is that Commodore make everything to do with computers, from the *micro-chip* to the computer casing.

So we have complete control over everything, from design to distribution.

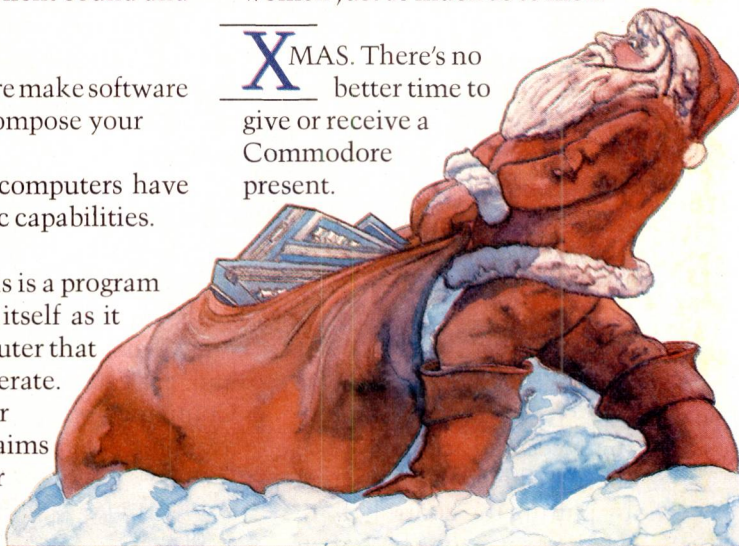
Also, everything has been specifically designed to get the very best out of your Commodore computer system.

**W**OMEN also are discovering computers – and not just in offices, but at home. Computers aren't sexist.



They were invented for everyone, and the fact that they're fun, exciting, educational, practical and time-saving are benefits that apply to women just as much as to men.

**X**MAS. There's no better time to give or receive a Commodore present.



**Y**IPPEE! Yes, now you know (or should do) that computers are really interesting. They're not just about space games with horrendous monsters. Nor are they horrendously complicated machines that you need a maths degree to understand.

Computers are the future, and it's important that you and, even more so, your children don't get left behind in the past.

With a Commodore computer and a *peripheral* or two (and we now know what those are, don't we?) whole new leisure and business opportunities will immediately be opened to you.

Make the choice now and (just so long as it's Commodore) we promise you will never regret it.

**Z**IP us a line if you would like to receive more information on any Commodore products.

Write or telephone: Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX. Tel: Corby (0536) 205252.



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# The missing link

*One way to write large programs easily is to break them into modules and then link the modules together. But problems often occur when deciding the address for each routine and making these addresses known to other modules for call purposes. JL Gordon examines a technique for module linking on the BBC Micro*

Whether you know it or not, you're probably a run-time debugger. Micro users regularly write programs on the 'I'll sort out the bugs when I've written it' basis, taking advantage of the interactive editing facilities of Basic on most micros.

Programs written in this way usually

micros will be able to adapt the programs to their own machines.)

The method consists of a suite of five programs (Listing 1), one of which will be repeated for as many routines as are needed. Each routine exists in its own file, giving the advantage of versatility. The function of the suite of programs is

*'Whether you know it or not, you're probably a run-time debugger. Micro users regularly write programs on the "I'll sort out the bugs when I've written it" basis, taking advantage of the interactive editing facilities of Basic on most micros.'*

work, which isn't surprising in view of the time and effort needed to get rid of all the error messages. The result is that a program performs something like the task for which it was intended, and is therefore used as is.

However, if it's a good program and is used regularly, the time will come when modifications are required. At this point, the author (or, worse still, another programmer) finds the work unreadable.

A modular approach to programming may prove to be a more rewarding exercise. Initial breakdown of the problem may yield items such as:

- A routine to input values.
- A routine to select from menu.
- A routine to do this.
- A routine to do that.

The items represent convenient sections of code to be written. If, during the design of a program, you decide to keep each section small with sensible remarks included in the coding, it's likely that the program will remain readable after the passage of time, even by a third party.

## Versatility

The approach offered here was specifically designed for a BBC Micro supporting a disk drive. The programs may be run on cassette, but the process will become very messy. (Users of other

to perform two passes across the files; the first pass will pick up all Global labels, and the second pass will assemble as normal but with access to Global labels from all other programs. Each program will also assemble its routine in the correct memory space, since the state of the assembly program counter is passed from one program to another.

The program 'LINKER' is used to generate a file on disk called W.VFILE, to initialise the file by inserting 'GOTO 10', and to move up in memory the start address of the other programs to allow space for the target machine code. Space for these programs will not need to be extensive, since each one will be short and only one program at a time

the program counter P%, (M%), to the base address for assembly. Another important function of LINKS is to install certain labels and their values in the file W.VFILE so that other routines may read them. The programmer may find that such things as operating system labels and addresses can be conveniently placed here, although they may be placed in any other routine. An important point, though, is that all zero page labels are declared and passed to W.VFILE by this routine: an example is to pass label names and values to W.VFILE. LINKS also changes the directory to 'W'; to keep work files as separate as possible from system files. CHAIN "FIRST ROUTINE" refers to the name of the first routine installed into the system.

The routines featured here must pick up the current variable name from W.VFILE, but Basic is not an easy language in which to do this. Consider a name 'A\$' and a value 'B' which have been read from the label file: how can we make the value of 'A\$' equal to the value of 'B'? Other languages like Lisp would take this problem well within their stride. The chosen solution is to 'EXEC' W.VFILE and then end the program. If the program is not ended, the EXEC will queue in the buffer until the program is finished. This results in the odd situation of an undefined label error stopping the program, and when

*'The program 'LINKER' is used to generate a file on disk called W.VFILE, to initialise the file by inserting "GOTO 10" and to move up in memory the start address of the other programs to allow space for the target machine code.'*

will reside in memory. The 'OUT' procedure is used to communicate with the EXEC file W.VFILE, and is included in each program. LINKER is used only once, at the setting up of the assembly. 'LINKS' is the start of the program assembly, and its main function is to set

this happens the label is defined on the screen by the EXEC file. Consequently, each time the EXEC file W.VFILE is updated, a new GOTO 10 must be added at the end. Each routine will perform this function.

\*FX119 closes the EXEC file and is



available in OS 1.2. GOTO10 is removed by altering the file pointer, so don't insert a space in the 'GOTO10' since GOTO10 plus one carriage return, seven characters in all, is part of the removal.

T% is the variable which keeps a record of what passes through the programs we are using.

'LINKW' is the work program, and space has been provided within this program to insert the assembly code required for each job. The name given to this program will be the one CHAINED by LINKS, which will in turn CHAIN the name of the next program until all code has been completed. The final work

which may appear at the end of a code, but which may be needed by early routines when they are tested before the whole suite of programs is complete. Certain routines may also require Basic to insert text into memory at the end of code (this function may also be performed in LINKL).

A modification which may make the program more versatile is to include a further names file of all the work programs to be included in the pass. Each work program will then look at this open file to see which program should be chained next. If the file is ended, then LINKEND must be chained. The file must be initiated by LINKS.

*'A modification which may make the program more versatile is to include a further names file of all the work programs to be included in the pass. Each work program will then look at this open file to see which program should be chained next.'*

program will CHAIN "LINKEND". Each work program performs two local passes to pick up forward references to local labels. However, since 'OPTU%' is only three when both T% and Q% are three, an ERRORS assembly is only performed on the second local pass of the second program pass. All labels which are considered Global should be sent to W.VFILE in the manner previously described (Global labels are those which may be used by other routines in the assembly).

'LINKEND' is simply to change the directory back to the '\$' directory and call 'LINKL'.

'LINKL' is the final program to be called, and is included to sort out the passes through the programs by testing the value of T%. The last routine has also proved useful to insert labels

Zero page labels and variables needing to be declared in 'LINKS' are mentioned above, and in fact may prove essential if the following error is to be avoided.

Consider the assembly tester program in Listing 2. This is an assembly of two simple subroutines, the second of which sends the character contained in 'NUMBER' to 'OSWRCH' if the character is less than 128. The location 'count' is incremented to keep a record of how many characters are successfully sent to 'OSWRCH'.

The main routine is intended as an example: it should cause a 'BEEP' and place the letter 'B' on the VDU. The location count is situated between the two routines. The first reference to count in location &400C stores zero in the wrong address; the routine calls to

'SEND' are also incorrect.

Note that the second reference to count in location &401E gets it right, because the reference occurs after the location of 'count' has been corrected on the second pass.

On the first pass of the assembler, the table of labels will be built up from the program counter position. Since the label 'NUMBER' is not yet known, the address is assumed to be absolute and the program counter value is placed in the code. If the label 'NUMBER' is declared at the start of the program, the assembler will know that NUMBER is a zero page location on the first pass, and will not place the absolute address of the program counter in the code.

Thus, the shuffling of label values, caused by the change in the value of the label NUMBER on the second pass, will not occur. NUMBER is referred to twice, and the incorrect addresses are two out.

Many of the available 6502 two-pass assemblers will also produce this error. It may be avoided in the case of the BBC Micro by causing three passes through the code — two no-errors and one error assembly.

The system described here avoids the problem by stipulating that zero page declarations must be placed in LINKS.

## Rewarding

A modular approach to programming in assembly language is far more rewarding than a do-it-all approach: the programmer may build up a library of routines.

If the assembler source code becomes long, or separate modules need uniting in a final program, thought must be given to the task of assembly in memory and to the label references which may be needed by many of the modules.

END

```
10 REM 'LINKER' SET UP PROGRAM
20 REM 2/3/84
30
40 MODE6
50 REM M% & P% ARE PROGRAM COUNTERS
60 T%=0 REM COUNT PASSES
70 %OPENOUT("W.VFILE"):REM LABEL FILE
80 PROCOUT("GOTO10")
90 CLOSE#%
92
93 REM MAKE SPACE FOR CODE AND START
100 PAGE=&3000:CHAIN"LINKS"
110
120 REM OUTPUT TO LABEL FILE PROCEDURE
130 DEF PROCOUT(X%)
140 FOR Q=1 TO LEN(X%)
150 BPUT#%:ASC(MID$(X%,Q,1))
160 NEXT
170 BPUT#%:13
180 ENDPROC
```

Listing 1 Set-up program

```
FIRST PASS THROUGH CODE.
*****
4000
4000 OPT PASS
4000 .START
```

Listing 2 Assembly tester program

Listing 2..... continued

```
4000 A9 00 LDA #0
4002 8D 02 40 STA count
4005 A2 07 LDX #7
4007 8E 07 40 STX NUMBER
400A 20 0A 40 JSR SEND
400D A2 42 LDX #66
400F 8E 0F 40 STX NUMBER
4012 20 12 40 JSR SEND
4015 60 RTS
4016 EA .count NOP \ USED AS COUNTER
4017 .SEND \ SUB ROUTINE USES OSWRCH_
4017 AD 17 40 LDA NUMBER
401A C9 80 CMP #128
401C B0 FE BCS MISS
401E 20 1E 40 JSR OSWRCH
4021 EE 16 40 INC count
4024 .MISS
4024 60 RTS
```

SECOND PASS THROUGH CODE.  
\*\*\*\*\*

```
4000
4000 OPT PASS
4000 .START
4000 A9 00 LDA #0
4002 8D 16 40 STA count
4005 A2 07 LDX #7
4007 8E 70 STX NUMBER
4009 20 17 40 JSR SEND
```



## Listing 2..... continued

```

400C A2 42      LDX #66
400E 86 70      STX NUMBER
4010 20 17 40   JSR SEND
4013 60         RTS
4014 EA         .count NOP \ USED AS COUNTER
4015           .SEND \ SUB ROUTINE USES OSWRCH
4015 A5 70      LDA NUMBER
4017 C9 80      CMP #128
4019 B0 09      BCS MISS
401B 20 EE FF   JSR OSWRCH
401E EE 14 40   INC count
4021           .MISS
4021 60         RTS

```

```

10 REM ASSEMBLY TESTER
20 REM TO ASSEMBLE TWO SUB ROUTINES
30 REM ONE AFTER THE OTHER.
40 REM WITH ONE VARIABLE DATA BYTE
50 REM IN BETWEEN.
60
70 FOR PASS = 1 TO 3 STEP 2
80 P%=%4000
90 [
100 OPT PASS
110 .START
120 LDA #0
130 STA count
140 LDX #7
150 STX NUMBER
160 JSR SEND
170 LDX #66
180 STX NUMBER
190 JSR SEND
200 RTS
210 .count NOP \ USED AS COUNTER
220 .SEND \ SUB ROUTINE USES OSWRCH
230 LDA NUMBER
240 CMP #128
250 BCS MISS
260 JSR OSWRCH
270 INC count
280 .MISS
290 RTS
300 ]
310 REM DECLARE LABELS HERE INSTEAD
320 REM OF AT THE START OF THE PROGRAM.
330 REM THEY WILL BE PICKED UP AT THE
340 REM END OF THE FIRST PASS.
350
360 OSWRCH = &FFEE REM OUTPUT CHARACTER
370 NUMBER = &70 REM ZERO PAGE VARIABLE
380 NEXT PASS
390 END

```

```

10 REM LINK START PROGRAM 'LINKS'
20 REM SET ZERO PAGE LABELS & OS CALLS
24
26 REM SET START OF MACHINE CODE
28 P%=%1900:M%=%1900
30
40 IF T%>0 THEN S%="OPENUP('W.VFILE') ELSE GOTO 150
50
60 REM VFILE POINTER TO END - 'GOTO10'
70 PTR#S%="EXT#S%-7
80
90 REM VARIABLES USED
100 PROCOUT("LABEL NAME = LABEL VALUE ")
110 REM + ALL OTHERS
120 PROCOUT("GOTO10")
130 CLOSE#S%
140
150 REM CHANGE TO WORKING DIRECTORY
160 $DIR W
170 CHAIN"FIRST ROUTINE"
180 END
190
200 DEF PROCOUT(X$)
210 FOR Q=1 TO LEN(X$)
220 BPUT#S%.ASC(MID$(X$,Q,1))
230 NEXT Q
240 BPUT#S%,13
250 ENDPROC

```

## Listing 1a Start program

```

5 *EXEC VFILE
6 END
10 REM LINK WORK SKELETON 'LINKW'
20 REM USED TO CONTAIN ALL ROUTINES
22 REM ENSURE EXEC FILE CLOSED
30 *FX119
40

```

## Listing 1b Workskeleton

## Listing 1b ..... continued

```

50 REM LOCAL TWO PASS ASSEMBLER PICKS
60 REM UP LOCAL LABELS
70 REM U% LEAVES NO ERRORS ASSEMBLY
80 REM TO SECOND LINKER PASS
90 FORQ%>0 TO 3 STEP 3
100 U%="T%ANDQ%"
110 P%="M% REM SET CONTINUOUS CODE
120 [
130 OPT U%
140
10000 ]
10001 NEXTQ%
10002 M%="P% REM PASS ON CODE POSITION
10003
10010 REM OUTPUT LABELS TO VFILE
10020 REM USING HANDLE S%
10030 IF T%>0 THEN S%="OPENUP('VFILE') ELSE GOTO11111
10038
10039 REM ADD ON LABELS - 'GOTO10'
10040 PTR#S%="EXT#S%-7
10041
10042 REM OUTPUT LABELS AS FOLLOWS
10043 REM WHERE XXX = LABEL NAME
10044 PROCOUT("XXX =" + STR$(EVAL("XXX")))
10998
10999 PROCOUT("GOTO10")
11000 CLOSE#S%
11001
11111 CHAIN"NEXT ROUTINE"
11112
11120 DEF PROCOUT(X$)
11130 FOR Q=1 TO LEN(X$)
11140 BPUT#S%.ASC(MID$(X$,Q,1))
11150 NEXT
11160 BPUT#S%,13
11170 ENDPROC

```

```

10 REM END OF LINKER ROUTINES 'LINKEND'
20
22 REM CHANGE BACK TO $ DIRECTORY
23 REM TO PICK UP LAST CODE IN LINKER
24 REM GROUP
30 $DIR $
40 CHAIN"LINKL"

```

## Listing 1c End of routines

```

5 *EXEC W.VFILE
6 END
10 REM LAST ROUTINE OF LINKER 'LINKL'
20
22 REM ENSURE EXEC FILE CLOSED
30 *FX119
40
50 P%="M%"
60 [
70 OPT T%
80 \ FINAL CODE SPACE FOR LABELS AT
90 \ END OF CODE OR RESERVE VARIABLE
100 \ SPACE
110 ]
120
130
140 REM IF SECOND PASS THEN CODE IS
150 REM COMPLETE
160 IF T%>0 THEN END
170
180 REM OUTPUT VARIABLES TO VFILE
190 REM USING HANDLE S%
200 REM WHERE 'XXX' STANDS FOR THE
210 REM VARIABLE OR LABEL NAME.
220
230 S%="OPENUP('W.VFILE')
240 PTR#S%="EXT#S%-7 REM SET POINTER
250
260 PROCOUT("XXX =" + STR$(EVAL("XXX")))
270
280 PROCOUT("GOTO10")
290
300 CLOSE#S%
310
320 REM AFTER FIRST PASS OF LINKER.
330 REM SET OPT TO ERRORS ASSEMBLY FOR
340 REM FINAL PASS
350 T%="3:CHAIN"LINKS"
360
370
380 DEF PROCOUT(X$)
390 FOR Q=1 TO LEN(X$)
400 BPUT#S%.ASC(MID$(X$,Q,1))
410 NEXT
420 BPUT#S%,13
430 ENDPROC

```

## Listing 1d Last routine



# TEACH YOURSELF LISP

*Dick Pountain's 'Teach Yourself' series goes one step further into the realm of recursion and factorial functions.*

This month we look at recursion, the major form of repetition in Lisp.

Every general purpose programming language must provide the means to repeat a sequence of actions until a specified condition is fulfilled, and then to stop repeating. In Basic this mechanism takes the form of FOR...NEXT when you know in advance how many times you want to repeat, and IF...GOTO when you don't. Both can be understood as being a loop, in which the computer is made to go back to a previous instruction in the sequence which makes up the program. We sometimes refer to the way the computer's attention is directed as 'control flow', and you can trace the control flow with your finger in a listing of the program.

This image of control flow doesn't fit in very well with the way Lisp works, namely by applying functions. In a Lisp program we're concerned with evaluation and the flow of values; Lisp is further removed from computer hardware and the idea of execution of instructions than Basic is. There is, however, a means of repetition that fits Lisp very well, and that is *recursion*.

A definition is said to be recursive if it refers to itself (remember that hoary old joke about the dictionary which included 'Recursion: see under Recursion?'). In Lisp, recursion involves using the function being defined in its own definition. Most people have an uneasy feeling when they first encounter a recursive definition; either it defies common sense and thus can't be allowed, or it leads to an endless loop, as with the fabled dictionary entry.

In Lisp, the first objection is false. The Lisp interpreter is quite happy to allow references to a function which is in some sense not yet defined. (It's really no more of a paradox than Basic accepting GOTO 1500 before you've written line 1500; in both cases the anomaly is resolved before you actually run the program.)

The second objection carries more

weight. It is indeed possible for a recursive definition to lead to an endless loop; this undesirable outcome can only be avoided on two conditions.

Firstly, each time the function calls itself it must be with an argument which is in some sense 'simpler' than before (perhaps smaller if it's a number, or shorter if it's a list). Secondly, there must be a test which is performed before recursion takes place, for a 'simplest' condition. When this condition is reached, the recursion ends. Rather than thinking of a loop or circle, think of a set of nested Russian dolls. Each doll contains one smaller than itself, but eventually you come to one which is solid, the end of the line.

## Factorial function

An example should clarify this, and with depressing predictability I've chosen to use the factorial function. The factorial of N is defined to be  $1 \times 2 \times 3 \times 4 \times \dots \times N$ , so factorial 5 is  $1 \times 2 \times 3 \times 4 \times 5$  or 120. It's possible to define the factorial recursively thus: 'The factorial of a number is that number multiplied by the factorial of one minus that number...'. or, in symbols:  $N! = N \times (N-1)!$ . Try working it through (don't hold your breath while doing so).

The simplifying condition is catered for in this definition by the 'one minus', but the simplest condition which ends the recursion hasn't been given. We need to add '... and the factorial of zero equals one'; this will now translate straight into Lisp (Fig 1).

NUM is made to equal 3 by the magic 'decanting' process I mentioned last month. The first COND clause says: 'If NUM is 0, then return 1 as the value of COND'. But NUM isn't 0, so this clause fails, and the next says: 'Otherwise, evaluate (TIMES NUM (FACTORIAL (DIFFERENCE NUM 1)))'. To do this, Lisp has to multiply 3 by (FACTORIAL (DIFFERENCE NUM 1)), whose value it doesn't know. But does it worry? No—it pluckily starts to work it out, putting the first job 'on hold'.

FACTORIAL is called again with the argument (DIFFERENCE NUM 1). The argument is always evaluated, and that's no problem here: it's simply 3-1, or 2. Now comes the trick shuffle. When FACTORIAL is entered the second time, NUM is made 2, but only for the duration of that evaluation. When it's finished and returns its value to the original job, the value of NUM will be restored to its original value of 3. Lisp 'remembers' the NUM value each time an evaluation is suspended for another recursive call. (Inquisitive individuals who like to know the nuts and bolts will have guessed by now that all the previous arguments are kept on a stack.)

The evaluation of FACTORIAL 2 proceeds as far as the TIMES expression, when it too is put on hold, and FACTORIAL 1 is evaluated. The same thing happens to this, and then FACTORIAL 0 is evaluated.

Now we have come to our solid doll. The first COND clause succeeds at last

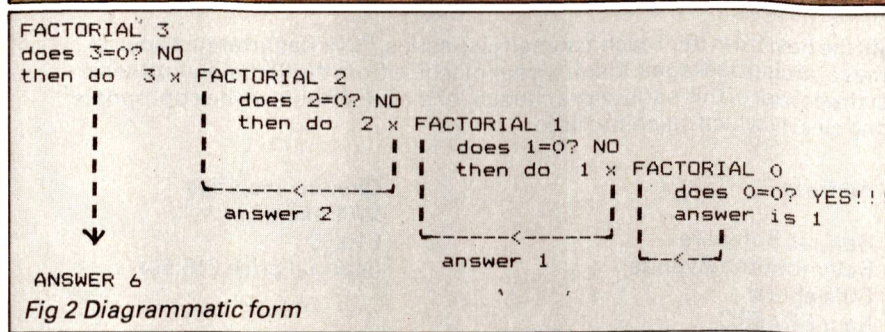
```
(DEFINE FACTORIAL (NUM)
  (COND
    ((EQUAL NUM 0) 1)
    (T (TIMES NUM (FACTORIAL (DIFFERENCE NUM 1))) )
  )
)
```

Fig 1 Lisp translation of factorial function

You could use ZEROP instead of EQUAL if you have it. Let's look in detail at how this works when (FACTORIAL 3) is evaluated.

because NUM is indeed 0, so the evaluation immediately returns the value 1. NUM is restored to the value 1, and the calculation of FACTORIAL 1 can





```
(DEFINE HUNT-FOR-EGG (LIST)
  (COND
    ((NULL LIST) 'EGGLESS!)
    ((EQUAL (CAR LIST) 'EGG) 'GOTTIT!)
    (T (HUNT-FOR-EGG (CDR LIST))) ) )
```

```
(DEFINE WHERES-EGG? (LIST COUNT)
  (COND
    ((NULL LIST) 'EGGLESS!)
    ((EQUAL (CAR LIST) 'EGG) COUNT)
    (T (WHERES-EGG? (CDR LIST) (PLUS COUNT 1))) ) )
```

**Fig 4 Creating a local working variable, COUNT**

can be finished, so the recursion 'unwinds', restoring the original value of NUM at each level, and multiplying it by the value returned from the level

Here, we've created a local working variable, `COUNT`, which is incremented each time the function recurses, and whose value is returned if the search is successful. At the moment, the only way we know to initialise the count to zero is to provide the zero as an



```
(DEFINE APPEND (LIST1 LIST2)
  (COND
    ((NULL LIST1) LIST2)
    ( T (CONS (CAR LIST1)
              (APPEND (CDR LIST1) LIST2) ) ) ) )
```

Fig 5 APPEND function

```
(DEFINE SWAP (NEW OLD LIST)
  (COND
    ((EQUAL LIST OLD) NEW )
    ((ATOM LIST) LIST )
    ( T (CONS (SWAP NEW OLD (CAR LIST))
              (SWAP NEW OLD (CDR LIST))) ) ) )
```

Fig 6 '... lists of lists of lists without modification.'

argument:

```
* (WHERESE-EGG?
  (BEAN BARN 7 BORN EGG 12)
  0)
```

In many dialects of Lisp it is legal to call WHERESE-EGG? with only one argument (the list), and any excess formal parameters, in this case COUNT, would be automatically bound to NIL (that's no help to us here as NIL isn't the same as zero, and in particular we can't add 1 to it). Acornsoft Lisp requires any 'spare' formal arguments to be placed within extra pairs of brackets. (You'll have noticed that our function gives the wrong answer (one less than the actual position of EGG), but I'm sure you can fix that.)

Both these previous functions demonstrate an important Lisp programming construction called 'recursing with the CDR', which is a general technique for travelling down a list. A complementary technique is to 'CONS with the CAR', thereby building a second list on the 'return stroke' as the

recursion unwinds (I always find that the image of a zip fastener springs to mind). The useful function APPEND, which joins two lists together, is a good example (remember that CONS only joins an atom to a list, and that (CAR LIST) is an atom (Fig 5)).

## From recursing to plain cursing

Before you pass from recursing to plain cursing, let's step through it with two simple lists — (APPEND '(LISP IS FUN)' (MY BRAIN HURTS)).

On the first pass through the NULL clause won't be triggered, so the T clause tries to CONS LISP onto (APPEND '(IS FUN)' (MY BRAIN HURTS)). This leads to a second call which attempts to CONS IS onto (APPEND '(FUN)' (MY BRAIN HURTS)), and so on until LIST1 is empty, whereupon the NULL clause is triggered and returns as its value LIST2. The recursion then unwinds by successfully CONSing the pieces of LIST1 onto LIST2 (in

reverse order, which is just what we require). The returned result is a new list; neither of the original lists are altered.

If you're still with me, try to step through this next program as your homework. It's a function which swaps a new word for every occurrence of an old word in a list, and could easily serve as a 'search-and-replace' command in that flashy Lisp editor you're going to write. It shows Lisp at its most daunting and most beautiful, in that it will handle lists of lists of lists to any depth without modification (Fig 6).

Note that the function has two recursive calls and two conditions. Which is the terminating condition for which call? Watch the type of LIST — it isn't always a list! Don't forget that () is NIL is an atom.

## Extra dimension

Don't be discouraged if you've found this discussion difficult. Despite all propaganda to the contrary, recursion is difficult, compared to simple loops which you can trace with your finger.

Recursion has, so to speak, an extra dimension, more like a turning inside-out than going round in a circle, and it places correspondingly greater strain on your powers of visualisation. But it's also enormously powerful and concise, and will well repay a lot of practice.

END

*This is part four of our six-part Teach Yourself Lisp series. Back issues can be obtained from our office at 53 Frith St, London W1A 2HG, tel: (01) 439 4242.*

## Lisp discount offer

To help you get the best from the Teach Yourself Lisp series, PCW has arranged special discounts on several Lisp packages. Identify your machine from the list below and send the offer tab at the corner of this page with a cheque for the full amount to the appropriate address, stating clearly which machine it is for.

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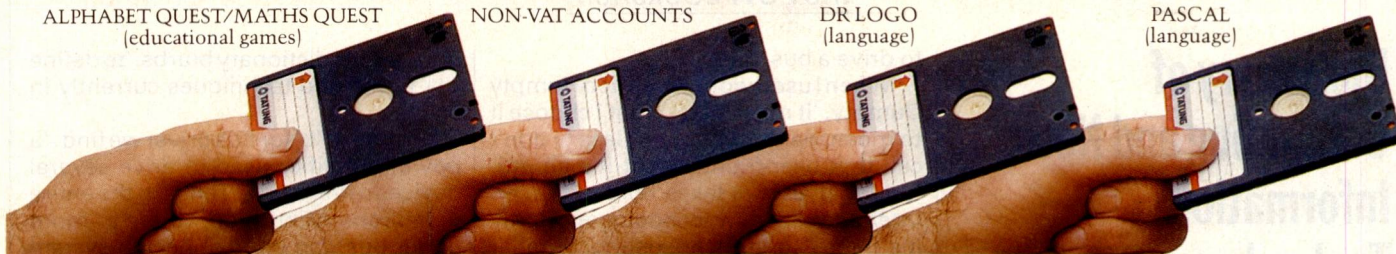


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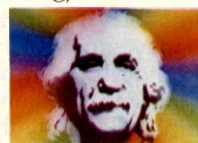


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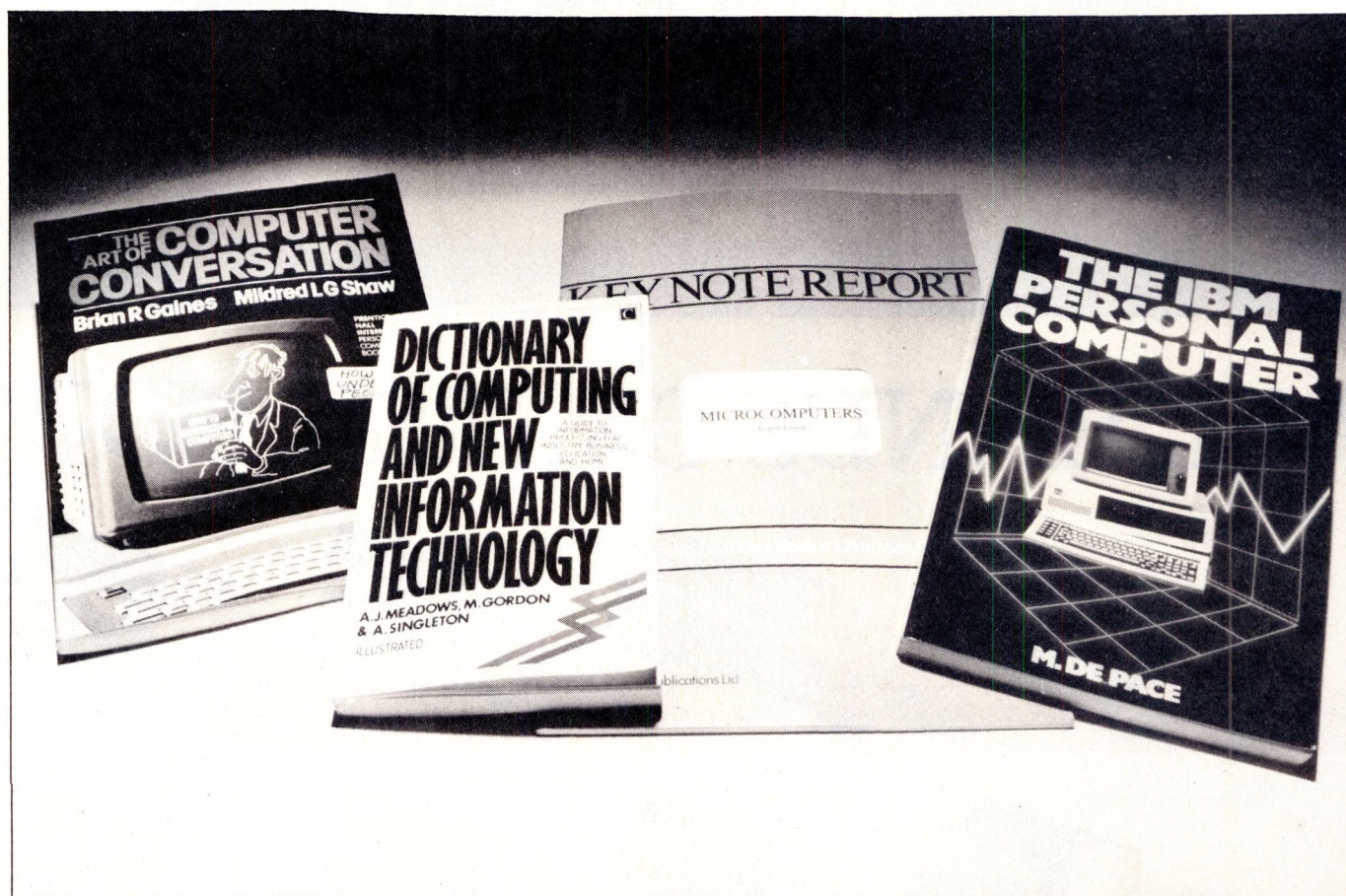
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*David Taylor finds there's more to the art of computer conversation than Isaac Asimov and wet cartoons, as he examines this month's selection from the PCW bookshelf.*

## Dictionary of Computing and New Information Technology

**Authors:** A.J. Meadows, M. Gordon and A. Singleton  
**Publisher:** Century  
**Price:** £2.95

'Do the words 'bus driver' mean what you think they do?' wonders this paperback 'guide to information processing for industry, business, education and home'. Certainly they do, I'd answer on behalf of the laymen it aims to enlighten. They mean a man who drives a bus. If computerniks want them to mean something else entirely, that's their business. End-users shouldn't have to know. You don't need to be able to strip a diesel engine, after all, in order

to drive a bus.

'When I use a word,' asserted Humpty Dumpty, 'it means just what I choose it to mean, neither more nor less.' I don't call that user-friendly, but it's an attitude that always takes hold at the, er, *interface* with new technologies. Partly it's handy to stretch existing, familiar words to describe the previously undefined. Mostly it's just fun to be part of a specialist gang with its own secret language — especially if it gets witty, like DDT: 'a software package designed to assist the debugging of programs.'

What's difficult is to initiate outsiders, especially those whose technological know-how may start and end at working a paper-clip. Yet outsiders do want to know what the weird usages mean, supposing that they'll then soon master the science. Computers are now so buzzily fashionable that there's a jargon-smart army lining up, just bursting to teach the duffers one end of a bus driver from another, to 'cut through the bewildering jungle of computer jar-

gon,' as this dictionary blurbs, 'to define key terms and techniques currently in use.'

Turning to 'b' for bus driver we find: 'a power amplifier used to drive several devices using a *bus*.' That's it: the entire definition. Mind you, there's more under bus: 'an interconnected system path over which information is transferred, from any one of many sources to any one of many destinations, the devices involved being connected in parallel.'

I find this about as helpful as defining Humpty Dumpty as 'a short, squat, egg-like being of nursery folklore' (Chambers). It's technically correct, but it doesn't get you far. Really, to know Humpty you have to read *Alice*. To get to grips with computers, your best bet is to use them.

Now and again, perhaps, a snappy dictionary definition might clear the fog on a one-off mystery, and you do get a few thousand chances here for under £3. Still, you'd have to be certifiably



computer-dumb to get much help from 'keyboard: a device equipped with an ordered array of keys', or 'system: an organised set of components (human beings, equipment, etc) which interact in a regulated fashion.'

QDOS, incidentally, which I imagine might easily stump those not accustomed to Sinclair, isn't in. Nor is the word Sir Clive recently told me came a close second when the company was fishing for a name for the QL's operating system, DOMESDOS. Kills all known bugs, it might have added.

## The Art of Computer Conversation

**Authors:** Brian R Gaines and Mildred L G Shaw

**Publishers:** Prentice-Hall International  
**Price:** £6.95

'We aim through this book,' say Brian and Mildred, a couple of Canadian electronics boffins with a numbingly prolix line in gee-whiz philosophy, 'to make specifiers of computer systems and programs aware of the need to devote as much effort to the human interface as they do to the data processing and storage algorithms.'

Oh yeah?

Now hear this. 'Transcendence of time and space adds new dimensions to the already dramatic powers of the human capabilities to learn from experience and to learn from conversation. New media provide new extension to ourselves and affect our, and our societies', modes of existence.'

Holy smoke, George and Mildred. Sorry, Brian and Mildred. This whole book could use a little work on its human interface. Even supposing readers can get the hang of the authors' tortured syntax, it takes real stamina to hang on in there when the simplest of notions are wrapped up into crazily affected examples and counter-proposals. I mean, try this: an assertion, Brian and Mildred style, that it's irritating when different computers have different operating commands — 'Perhaps someone who has a Chinese butcher, a French dressmaker and an Ethiopian barber has similar problems. Maybe even they would lose their cool if the butcher required Mandarin to be used when ordering beef and Cantonese for lamb. Such seems to be the world of the computer.'

They may have a point. But do we need the rigmarole of foreign traders to describe it? In fact, Brian and Mildred really only have one point throughout 200 dense pages, which is that computers are better when they're user-friendly. Yet on the way to convincing us of that, we get structured proverbs, we get wet cartoons, we get quotations from Dostoyevsky and Plato, we get a run-through of hip American medical diagnostics programs like SHRDLU and TEIRESIAS, we get chunks of Isaac

Asimov and clips from 2001 — A Space Odyssey, we get a peek at 'behaviour-dyne vocational guidance by computer' and, before too long, we get the feeling that we're going to shriek and chuck this book at the nearest all-American analyst.

It isn't that Brian and Mildred cannot provoke useful thought around the concepts of 'people literate' computers or methods of 'user-computer dialog'. To the kind of Professor Brainstorm programmer who is fluent in two dozen operating systems but who has trouble writing an intelligible note for the milkman, their guidelines may well come as a revelation. But the irony for idle browsers is that so self-consciously intense is the approach, the book finishes up user-hostile. I think I'd have called it *The Art of Computer Conversation-Stopping*.

## Microcomputers: An Industry Sector Overview

**Publisher:** Keynote Reports

**Price:** £60 (from Keynote Publications, 28/42 Banner Street, London EC1Y 8QE)

More fascinating facts and figures, this time from Keynote's team of hawk-eyed analysts who kick off with the quirky assertion: 'The performance of the microcomputer market in Britain can be gauged by a visit to either of W H Smith's bookstalls at Victoria Station.'

What they have in mind is that six per cent of the news shelves groan under the weight of micro mags, reflecting the fact that 1.2 million Britons bought a micro last year.

As sophisticated industrial indicators go, a newsagency's shelf space may not immediately strike you as a precise parameter. But it may have to do, since, as Keynote has the honesty to point out, 'statistics on the microcomputer market are notoriously inaccurate.'

What Keynote's report does, and does commendably well, is to present an overall digest of what micros are, what they do, who uses them, what for, and which brands are currently making the running. It then adds well-educated guesswork to such reliable figures as it can find to come up with a crisp survey of the market as is, take a squint into the future (and again see Japanese ahoy), and finally append a useful list for further reference.

The result is a lucid brief which, though it might send veteran home-hackers or the zap-kapow micro-nutters to sleep, does very smartly cover the essential ground for those who are pin-sharp in their own field, but who may still be a bit computer-vague. It's for intelligent but under-informed readers with a need to grasp the gist of what's happening out there in the

volatile micro market — a sort of up-market school essay. I'd give it at least alpha minus.

## The IBM Personal Computer

**Author:** M De Pace

**Publisher:** Granada

**Price:** £7.95 (paperback)

You'd need an XT version, I'd imagine, just to catalogue the books published to date on the Jolly Blue Giant's friendly micro. It seems that scarcely a week goes by without someone, usually called something very like M De Pace or Walt B Winchester, re-writing the PC's already lucid *Guide to Operations*, paraphrasing the DOS manual, or once more taking the bucket to the well of *IBM Basic*.

And yet, apparently, they sell like *Lotus 1-2-3*. A few PC add-on manuals, like the inestimable Peter Norton's which probes inside the thing's innards and conducts escorted treks through the darker thickets of DOS, are useful amplifications for the already adept applications user who might want to join the programming *cognoscenti*. But many more PC books tend only to run through the manuals one more time, then lash together little more than a guide to hardware expansion and software packages which is often out of date almost as soon as the book's published.

This latest falls between the two extremes. On the one hand it does provide, for example, a bit of handy hand-holding for database and spreadsheet first-timers (albeit through the silly example of costing a sponge cake), gives you an outline of such up-and-coming wonders as Unix, and helps you assess word processing and introduces mice.

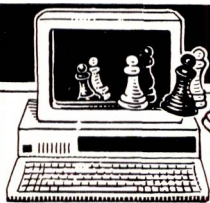
On the other hand, it contains such ludicrous illustrations as a solid black circle with a hole in the middle, captioned: 'The inner diskette (courtesy of IBM (UK) Ltd)', and includes such fatuous insights as: 'A PC consists of screen, keyboard and system unit' and 'Having connected the units, it is now time to switch on. The power switch is located on the right-hand side of the system unit.'

Hang on, Mr De Pace, not so fast! You've not given us any step-by-step instructions yet on how to open the cardboard boxes!

One thing I would like to know, which neither this nor any other IBM user's handbook has explained to me, is why the fan on my own PC's power supply sounds like a Mississippi paddle-steamer struggling upstream. Not a fault, claims the maker: some fans just gurgle a bit. This won't do. I need a Helpful Hint that begins: 'the point at which to apply a sharp biff with a rubber-headed hammer is located at...'

END





## MICROCHESS

# An elitist game

*Apart from improvements in speed at the higher playing levels, there is not much more that the average chess player could possibly want from the best of today's chess computers. And as Tony Harrington notes, when it comes to new products Fidelity and Novag are way out in front.*

By the time you read this the World Micro Computer Chess Championship (WMCCC), held this year in Glasgow, will be over. A full report will appear in December's *PCW*.

Without denigrating other suppliers' machines, the World Championship looks at the time of writing to be a two horse race between the Novag and Fidelity programs.

Fidelity won last year's WMCCC, but the Novag Super Constellation has had some very encouraging player-tournament results and the battle looks to be unpredictable.

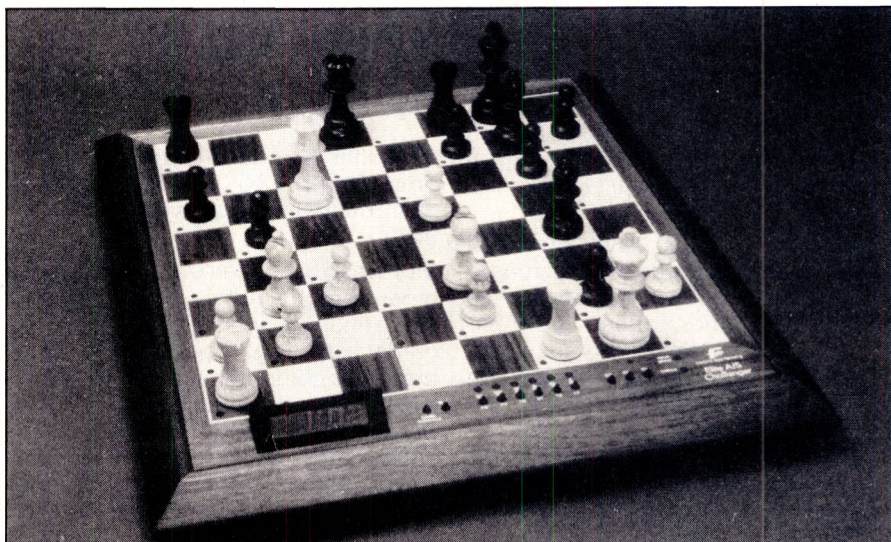
I have not yet had the opportunity to explore the Super Constellation, but I have, however, had Fidelity's Budapest program on trial for the last few weeks. Very impressive it is, too.

The Fidelity Elite Budapest program is a very expensive piece of equipment, costing nearly £600. It's a fine, auto-sensory wooden board and pieces with a manual comprising more than 50 pages!

But for those who don't have that sort of money, hang on for a bit, Fidelity will be launching the Sensory 12, priced at £295, in September, which will have the same program as the Elite (Budapest), and most of the features (though it will be a sensor board, not an auto-sensory board — in other words, touch-sensitive, and not automatically activated by magnets in the base of the pieces).

I was unable to establish whether or not it will have the Elite's glorious Blitz chess capability. It certainly won't have the full Blitz feature, since the little LCD display on the Elite, which, in Blitz games, shows the clocks for both players, is not on the Sensory 12.

The month of September will also see the release of Fidelity's Elegance Chess Challenger, the Fidelity Experimental. The Elegance will, however, have a removable EPROM program, so users will always be able to have the latest



*The Fidelity Elite isn't cheap but it's worth its weight in gold for Blitz chess*

'experimental' program.

For anyone under county strength who is keen on Blitz chess, the Elite AS (Budapest) is worth its weight in gold. Games are decided on time as well as on over the board play. The program has a very sure grasp of positional and tactical play and its blunders are as rare as they are surprising; but *when* they come, the blunders look as grotesque as any oversight made by a player. In complex mid-game positions, playing almost instantly under Blitz conditions it repeatedly found interesting attacking moves. In defence, it was resourceful. See the Blitz games (1 and 2) for evidence of its style in attack and defence.

My major criticism is that despite the pseudo sophistication of a voice chip, which computer speaks its way right through the game — even at Blitz chess — Fidelity is still sticking with a ludicrously complicated method of communication between user and processor.

Firstly, there are twelve little pins which form a sort of keyboard. You have to press the extreme left-hand pin,

labelled 'game control', pick up and put down Black's Queen, which lights the LCD at d8, then press the pin marked 'cl' for 'clear'. This clears out the memory and sets all the values to zero ready for a new game. It has to be done each time you want to play a new game. To get to Blitz mode there is another rigmarole to be gone through. Pressing the 'lv' pin, ('level') gets you into 'level-setting mode'; picking up the pawn on b2 and replacing it lights the LCD on ' that square and causes 'HO:05' to come up on the LCD display screen. This is your Blitz clock time.

It is adjusted by repeated pressings of the 'lv' key to add minutes to the time, the 'tb' ('take-back') key to add 10 minute chunks and the 'st' (time control/position score/level setting') pin to add one to nine hours to the clock. After all this, you are still not finished. There still remains the specifying of the computer's clock time, which is independently set. Picking up the pawn on b2 and replacing it once more changes the display to CO:00 and the pin pushing has to begin again to set this clock.



The process, once understood, is quick enough. It also has the great merit of allowing you to set the two clocks independently. This is useful not just for 'time-handicapping' but for strict fairness since, like all chess computers, the Elite 'steals' a little of its opponent's time during the piece moving operation — and in Blitz chess a half a minute or so over a whole game can often be the decisive factor.

But I am against the business of POKEing values into the processor by a whole host of complicated board-and-keystroke combinations. For a start it makes the process of learning to use all the functions available on the Elite AS unnecessarily complicated. And for a second, at that price I see no reason why a decent set of symbolic keys couldn't be provided for one-touch implementation of all the functions.

I would also have expected one or two additional functions to be present in such an expensive machine. It is perfectly possible to step back, move by move, all the way to the beginning of a game, but there is no facility for stepping forward. There is no 'replay' key, possessed by even the crudest home computer chess programs, which will automatically replay the game, move by move, from the beginning.

The voice chip is an unnecessary extra which can be irritating or endearing, depending on your mood.

Those are the grumbles. But on the positive side, the Elite AS (Budapest) program (not to be confused with the

ordinary AS program which predates Budapest and is definitely weaker) must, with the possible exception of the Super Constellation, be the best thing on the market at the moment.

**Game No 2: Player versus Fidelity. Game time limit: five minutes each (Blitz chess). This time the Elite opts for a weak defensive line and pays the price.**

|    |        |        |    |        |        |
|----|--------|--------|----|--------|--------|
| 1  | e2e4   | c7c5   | 12 | b2xc3  | Nh6f5  |
| 2  | Ng1f3  | Nb8c6  | 13 | e4xf5  | Bd7xf5 |
| 3  | d2d4   | c5xd4  | 14 | O-O    | e7e5   |
| 4  | Nf3xd4 | g7g6   | 15 | Rf1d1  | e5e4   |
| 5  | c2c4   | Bf8g7  | 16 | Nf3d4  | Nc6e7  |
| 6  | Nd4f3  | Ng8h6  | 17 | Nd4b5  | Ne7c8  |
| 7  | Nb1c3  | d7d5   | 18 | Be3d4  | a7a6?  |
| 8  | Bf1e2  | O-O    | 19 | Bd4f6! | a6xNb5 |
| 9  | h2h3   | Bc8d7  | 20 | Qd2h6  | Bf5d7  |
| 10 | Bc1e3  | Qd8a5  | 21 | Qh6g7  | mate   |
| 11 | Qd1d2  | Bg7xc3 |    | 1-O    |        |

## Games section

The last two Micro Chess games have featured David Levy giving a superb demonstration of how to play against a computer (August & September issues).

This month's game is a sort of 'computer's revenge'. The Super Constellation is playing Black against five-times US Women's Champion Diane Savereide. Unlike David Levy, Diane entered into an ultra-sharp and highly theoretical opening variation. At the crucial moment she adopted a faulty continuation of the attack, easy to do in a very complex position. The Constellation took over the initiative and pressed its advantage home in ruthless fashion. Although the human played into the computer's hands by her choice of opening, this is nevertheless one of the most impressive games I have ever seen by a commercial machine.

**White: D Savereide. Black: Super Constellation. (Level 7). Notes by Grandmaster Dr John Nunn**

|    |        |        |
|----|--------|--------|
| 1  | e2-e4  | c7-c5  |
| 2  | Ng1-f3 | d7-d6  |
| 3  | d2-d4  | c5xd4  |
| 4  | Nf3xd4 | Ng8-f6 |
| 5  | Nb1-c3 | a7-a6  |
| 6  | Bf1-c4 | e7-e6  |
| 7  | Bc4-b3 | b7-b5  |
| 8  | O-O    | Bf8-e7 |
| 9  | f2-f4  | Bc8-b7 |
| 10 | e4-e5  | d6xe5  |
| 11 | f4xe5  |        |

(In this opening White stakes everything on a quick attack. If the assault founders White stands to lose the ending because of the weak pawn at e5.)

|    |               |
|----|---------------|
| 11 | ... Be7-c5    |
| 12 | Bc1-e3 Nf6-d7 |

(The first new move of the game. 12... Nb8-c6 and 12... Bc5xd4 are the accepted alternatives, but the Constellation strikes out on new paths.)

|    |        |
|----|--------|
| 13 | Qd1-h5 |
|----|--------|

(All that is new is not necessarily good, and here White missed the chance to play 13 Rf1xf7! Ke8xf7 14 Qd1-g4. The only reasonable defence is

14... Qd8-b6, but then 15 Kg1-h1! gives White a tremendous attack for the sacrificed rook. After 15... Bc5xd4 16 Be3xd4 Qb6-c6, for example, 17 Nc3-e4 leaves Black in dire straits.)

|    |         |
|----|---------|
| 13 | ... 0-0 |
|----|---------|

|    |         |
|----|---------|
| 14 | Rf1-f4? |
|----|---------|

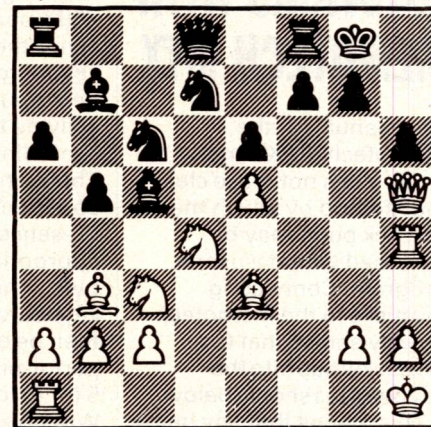
(This move is a serious error. White should have played 14 Kg1-h1 Nb8-c6 (14... Qd8-b6 is met by 15 Rf1-f4, since the queen has given up the chance to move to g5 as in the game) 15 Be3-g5 Bc5-e7 (after other moves Black is crushed by the sacrifice Nd4xe6) 16 Nd4-f3 with dangerous threats on the kingside.)

|    |            |
|----|------------|
| 14 | ... Nb8-c6 |
|----|------------|

|    |              |
|----|--------------|
| 15 | Rf4-h4 h7-h6 |
|----|--------------|

|    |        |
|----|--------|
| 16 | Kg1-h1 |
|----|--------|

(After this Black demonstrates a forced win, but there was no real improvement.)



|    |            |
|----|------------|
| 16 | ... Bc5xd4 |
|----|------------|

|    |                |
|----|----------------|
| 17 | Be3xd4 Qd8-g5! |
|----|----------------|

(A profound move. I commented earlier that an end game would favour Black and this move, which forces the exchange of queens, isn't easy for a machine to find.)

|    |              |
|----|--------------|
| 18 | Qh5xg5 h6xg5 |
|----|--------------|

|    |               |
|----|---------------|
| 19 | Rh4-g4 Nc6xd4 |
|----|---------------|

|    |               |
|----|---------------|
| 20 | Rg4xd4 Nd7xe5 |
|----|---------------|

(White can regain the lost pawn, but only at the cost of allowing Black to develop a powerful counter attack.)

|    |               |
|----|---------------|
| 21 | Ra1-e1 Ne5-g6 |
|----|---------------|

|    |               |
|----|---------------|
| 22 | Rd4-g4 Ra8-d8 |
|----|---------------|

|    |               |
|----|---------------|
| 23 | Rg4xg5 Ng6-f4 |
|----|---------------|

(The relative activity of the two bishops is the key to the position. White's cannot move, while Black's exerts terrible pressure against g2. Already 24... Rd8-d2 is threatened.)

|    |                |
|----|----------------|
| 24 | Re1-f1 Nf4xg2! |
|----|----------------|

(This little combination finishes the game.)

|    |               |
|----|---------------|
| 25 | Rg5xg2 Rd8-d2 |
|----|---------------|

|    |               |
|----|---------------|
| 26 | Rf1-g1 Rf8-d8 |
|----|---------------|

(White cannot meet the threat of 27... Rd2xg2 28 Rg1xg2 Rd8-d2.)

|    |               |
|----|---------------|
| 27 | Bb3-d5 Rd8xd5 |
|----|---------------|

|    |         |
|----|---------|
| 28 | Rg2xg7+ |
|----|---------|

(After 28 Nc3xd5 Bb7xd5 White is utterly paralysed.)

|    |            |
|----|------------|
| 28 | ... Kg8-f8 |
|----|------------|

|    |                |
|----|----------------|
| 29 | Rg7-g8+ Kf8-e7 |
|----|----------------|

|    |                |
|----|----------------|
| 30 | Rg1-g3 Rd5-e5+ |
|----|----------------|

|    |         |
|----|---------|
| 31 | Resigns |
|----|---------|

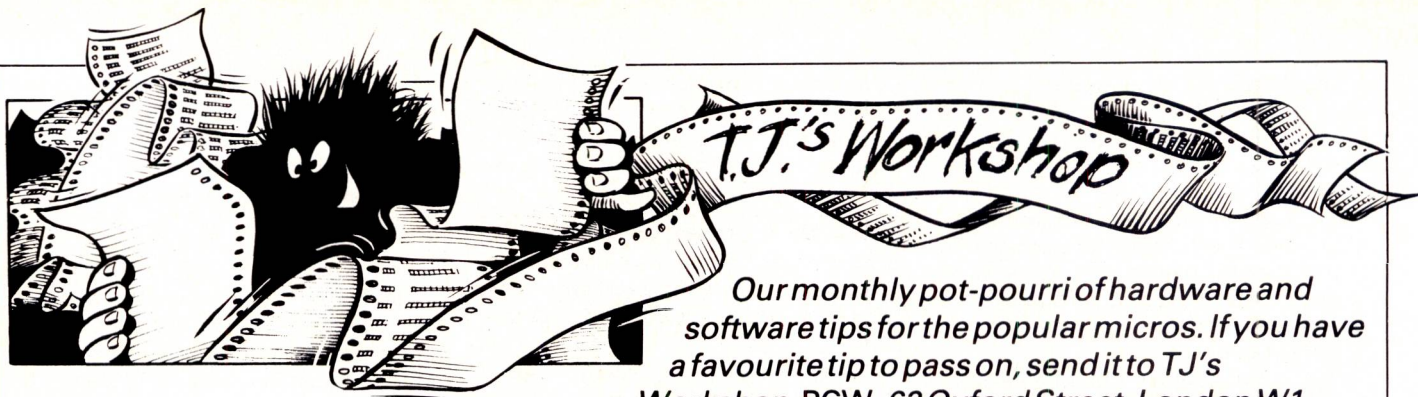
(White is mated in two more moves.)

**END**

**Game No 1: player versus Fidelity Elite AS (Budapest). Game time limit: five minutes (Blitz chess)**

|    |        |        |    |         |          |
|----|--------|--------|----|---------|----------|
| 1  | e2e4   | e7e5   | 37 | Rb2b5   | Re6d6    |
| 2  | Ng1f3  | Nb8c6  | 38 | h3h4    | Rd6c6    |
| 3  | Bf1b5  | a7a6   | 39 | h4h5    | Rc6d6    |
| 4  | Bb5a4  | Ng8f6  | 40 | Kg2h3   | h7h6     |
| 5  | O-O    | Nf6xe4 | 41 | kh3g4   | Rd6d4    |
| 6  | Rf1e1  | f5f7   | 42 | Rb5xb6  | Rd4xa4   |
| 7  | Ba4xc6 | d7xc6  | 43 | Kg4f5   | Ra4b4    |
| 8  | d2d3   | Ne4f6  | 44 | Rb6a6   | Rb4b5+   |
| 9  | Nf3xe5 | Bf8e7  | 45 | Kf5xf4  | Rb5xh5   |
| 10 | c2c3   | O-O    | 46 | Kf4g4   | Rh5d5    |
| 11 | Nb1d2  | f5f4   | 47 | f3f4    | h6h5+    |
| 12 | h2h3   | Nf6d5  | 48 | Kg4g3   | Rd5c5    |
| 13 | Nd2f3  | a6a5   | 49 | f2f3    | Kg8f7    |
| 14 | a2a4   | c6c5   | 50 | Kg3h4   | g7g6     |
| 15 | d3d4   | c5xd4  | 51 | Kh4g3   | Rc5d5    |
| 16 | c3xd4  | Ra8a6  | 52 | Kg3h4   | Rd5b5    |
| 17 | Bc1d2  | Bc8f5  | 53 | Kh4g3   | Rb5c5    |
| 18 | Bd2c3  | Nd5xc3 | 54 | Kg3h4   | Rb5d5    |
| 19 | b2xc3  | Qd8d5  | 55 | Kh4g3   | Rd5f5    |
| 20 | c3c4   | Qd5d8  | 56 | Ra6c6   | Rf5f6    |
| 21 | c4c5   | Qd8d5  | 57 | Rc6c5   | Rf6a6    |
| 22 | Qd1d2  | Bf5e4  | 58 | f4f5    | a5a4     |
| 23 | Qd2a2  | Qd5xa2 | 59 | f5xg6+  | Kf7xg6   |
| 24 | Ra1xa2 | Be4d5  | 60 | Rc5c2   | a4a3     |
| 25 | Ra2b2  | Ra6e6  | 61 | Rc2a2   | Ra6a5    |
| 26 | Rb2e2  | Rf8e8  | 62 | Kg3f4   | h5h4     |
| 27 | Nf3d2  | Be7f6  | 63 | Kf4g4   | Ra5a4+   |
| 28 | Nd2f3  | Bd5c6  | 64 | Kg4h3   | Kg6f5    |
| 29 | Re2a2  | Bc6xf3 | 65 | f3f4    | Kf5xf4   |
| 30 | g2xf3  | Bf6xe5 | 66 | Kh3xh4  | Kf4e5(+) |
| 31 | Re1xe5 | Re6xe5 | 67 | Kh4g3   | Ke5d4    |
| 32 | d4xe5  | Re8xe5 | 68 | Kg3f3   | Kd4c3    |
| 33 | Ra2c2  | Re5e1+ | 69 | Kf3e3   | Kc3b3    |
| 34 | Kg1g2  | Re1e6  | 70 | Resigns |          |
| 35 | Rc2b2  | b7b6   |    | O-1     |          |
| 36 | c5xb6  | c7xb6  |    |         |          |





Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's

Workshop, PCW, 62 Oxford Street, London W1.

Please keep your contributions concise. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

## USE OF JOYSTICKS WITH MEMOTECH MTX

The manual for the Memotech MTX series micro does not make clear the method by which the joystick ports may be accessed within a user's program. Connecting joysticks to the Memotech quickly shows that the joysticks map into the keyboard as shown below.

This means that any game requiring joysticks can be played from the keyboard instead (albeit more clumsily). Also, it means that to use joysticks within your own programs, you need only read the keyboard (for example, with INKEY\$ in Basic) to determine the joystick status.

The problem with using INKEY\$ (or the CHARGET routine in machine code) is that multiple key closures cannot be sensed in this way, so one is confined to the four primary directions plus fire. It is frequently desirable in a game to permit diagonal movement on the screen or to allow firing while moving, making it necessary to sense a number of key closures simultaneously (right and up, for example). To do this on the Memotech, one first needs to understand how

the keyboard may be read directly.

The Memotech keyboard is arranged on two of the Z80's ports, 5 and 6. To sense the status of the keyboard, a byte has first to be output on port 5 to activate the appropriate sense lines of the keyboard. These lines are active low, so are activated by the presence of a zero in the appropriate bit of this 'sense byte'. The status of the keyboard read lines may then be determined by performing an input on port 5 (or 6) to yield a 'read byte'. Wherever a read line is active (because a key has been pressed), a zero will appear in the corresponding bit of the read byte. The problem is to determine the appropriate sense/read byte combinations for the keys of interest. (Normally, of course, this is all handled for us by the CHARGET routine in ROM).

The Basic routine in Fig 1 will cycle through the sense bytes to set each sense line in turn and display the resulting read byte. By running this routine while holding down keys, one can determine the combination needed to examine specific keys. The routine only inputs from port 5 as the majority of keys appear here (note that the space bar is one exception).

It's a simple matter to change the routine to investigate port 6, too. Be

aware, however, that only the bottom two bits of the read byte from port 6 are keyboard read lines.

Once the sense/read byte combinations have been determined, they can be incorporated into a user-written keyboard read routine. Machine code is best for this as it's much quicker than Basic, and avoids the timing problems which close examination of the output from the Basic routine will reveal.

Two machine code routines for reading the joysticks (or equivalent keys of the keyboard) are given here: one to look at the right-hand joystick, the other the left. Each is used from Basic in exactly the same way; the differences between the two routines merely reflect the different sense/read byte combinations required. Ironically, the left-hand joystick is the more convenient to code for. Each routine will scan the appropriate joystick and set bits of an internal byte (called KEYS) to reflect the joystick status. These bits are set as follows:

KEYS: BIT 4 set if FIRE pressed;  
BIT 3 set if DOWN pressed;  
BIT 2 set if UP pressed;  
BIT 1 set if

RIGHT pressed;  
(LSB) BIT 0 set if LEFT pressed.

The final value of this byte will, therefore, be determined by the combination of joystick controls active. The value may be retrieved in Basic using a PEEK instruction.

The complete program (Fig 2) shows the routines as they may be used from Basic (note that the variables KEYR and KEYL point to the KEYS bytes within the routines). The exact values of these variables will depend upon the memory size of your Memotech (adjust the variable MTX as indicated in the program) and also upon the degree of comment included in the machine code routines. Adjust the values to equal those indicated by the appropriate assembler symbol table (lines 20 and 30).

When the program is RUN, a balloon will appear which can be moved around the screen with either joystick (although the right-hand one has priority) and will change colour whenever the fire key is pressed. This program shows how easy (and convenient) it is to blend machine code and Basic on the Memotech to impressive effect.

Steve Benner

|                       |        |                              |
|-----------------------|--------|------------------------------|
| Right-hand joystick   | : FIRE | — HOME key;                  |
| LEFT, RIGHT, UP, DOWN |        | — corresponding cursor keys. |
| Left-hand joystick    | : FIRE | — SPACE BAR;                 |
|                       | LEFT   | — Z key;                     |
|                       | RIGHT  | — C key;                     |
|                       | UP     | — B key;                     |
|                       | DOWN   | — M key.                     |

```

290 REM *****
292 REM ** Routine to strobe keyboard
;
295 LET PORT=5
300 FOR S=0 TO 7: LET SS=255-2*S: OUT (5),SS
305 LET R=INP(PORT): PRINT "Sense ";SS,"Read ";R
310 NEXT
315 PAUSE 1000: PRINT : PRINT : GOTO 300

```

Fig 1 Sense: read byte routine





```

1 GOTO 100
20 CODE
4010 GETRTJ: XOR A :Clear A
4011 LD HL,KEYS
4014 LD (HL),A :Clear KEYS
4015 FIRE: LD A,£DF :Strobe for HOME
4017 CALL STROBE
401A JR, NZ,LEFT
401C SET 4,(HL)
401E LEFT: LD A,£F7 :Strobe for left
4020 CALL STROBE
4023 JR NZ,RIGHT
4025 SET 0,(HL)
4027 RIGHT: LD A,£EF :Strobe for right
4029 CALL STROBE
402C JR NZ,UP
402E SET 1,(HL)
4030 UP: LD A,£FB :Strobe for up
4032 CALL STROBE
4035 JR NZ,DOWN
4037 SET 2,(HL)
4039 DOWN: LD A,£BF :Strobe for down
403B CALL STROBE
403E JR NZ,DONE
4040 SET 3,(HL)
4042 DONE: RET
4043 KEYS DB 0
4044 STROBE: OUT (5),A :Do joystick strobe
4046 IN A,(5)
4048 CP 127
404A RET

```

#### Symbols

|        |      |      |      |
|--------|------|------|------|
| GETRTJ | 4010 | KEYS | 4043 |
| STROBE | 4044 | LEFT | 401E |
| RIGHT  | 4027 | UP   | 4030 |
| DOWN   | 4039 | DONE | 4042 |
| FIRE   | 4015 |      |      |

```

21 RETURN
30 CODE
41A6GETLTJ: XOR A :Clear A
41A7 LD HL,KEYS
41AA LD (HL),A :Clear KEYS
41AB FIRE: LD A,127 :Strobe SPACE-BAR
41AD OUT (5),A
41AF IN A,(6)
41B1 BIT 0,A
41B3 JR NZ,STROBE
41B5 SET 4,(HL)
41B7 STROBE: LD A,127 :Strobe left joystick
41B9 OUT (5),A
41BB IN A,(5)
41BD LD D,A
41BE AND £F0 :Check bottom row keys
41C0 CP £F0
41C2 JR, NZ,DONE :Ignore if not
41C4 LD A,D :Restore A
41C5 CPL :Set all bits in one go!
41C6 ADD A,(HL) :Add in FIRE bit
41C7 LD (HL),A
41C8 DONE: RET
41C9 KEYS: DB 0
41CA RET

```

#### Symbols

|      |      |        |      |
|------|------|--------|------|
| FIRE | 41AB | STROBE | 41B7 |
| DONE | 41C8 | GETLTJ | 41A6 |
| KEYS | 41C9 |        |      |

```

31 RETURN
97 REM *****
98 REM **
99 REM ** MAIN CODE STARTS HERE — SET UP
   SCREEN FIRST
;
100 GENPAT 3,0,24,60,60,24,00,24,24,00
110 VS 4: CLS : COLOUR 0,1: COLOUR 4,1
120 CTLSPR 2,1: CTLSPR 6,1
125 LET X=10: LET Y=8: SPRITE 1,0,X,Y,0,0,10
126 REM
127 REM *****
128 REM ** Set up SPEED; & PEEK locations (MTX=8
   for 500); See M/C for values
;
130 LET SPEED=4: LET MTX=4
150 LET KEYL=MTX*4096+256*1+12*16+09: LET
   KEYR=MTX*4096+4*16+3
190 REM
191 REM
192 REM *****
193 REM **
194 REM ** Poll keyboard and recalculate coordinates
;
200 GOSUB 20: LET JOYS=PEEK (KEYR): IF
   JOYS=0 THEN GOSUB 30: LET JOYS=PEEK (KEYL)
210 IF JOYS=0 THEN GOTO 200
215 IF JOYS>15 THEN LET JOYS=JOYS-16: ADJSR
   1,1,RND*14+1
220 IF JOYS>7 THEN LET JOYS=JOYS-8: LET
   Y=Y+SPEED* (Y>10)
225 IF JOYS>3 THEN LET JOYS=JOYS-4: LET
   Y=Y-SPEED* (Y<180)
230 IF JOYS>1 THEN LET JOYS=JOYS-2: LET
   X=X-SPEED* (X<250)
235 IF JOYS>0 THEN LET JOYS=JOYS-1: LET
   X=X+SPEED* (X>10)
240 ADJSR 2,1,X: ADJSR 3,1,Y: GOTO 200
250 REM
251 REM *****
   *****

```

Fig 2 Complete program

## SORD TIPS

If you ever get fed up waiting for long programs to load, then perhaps you haven't found the secret of changing the rate at which programs are saved.

Type POKE &7019,&12 before you save a program, and the cassette baud rate will be almost doubled. (This works on BASIC-I and BASIC-G). If your cassette recorder cannot cope with the given value of &12, try others until you find the fastest you can safely use. The higher the value POKEd, the slower the baud rate.

**Note:** You do not need to change the POKEd value to load in files recorded at different speeds—the computer works out what

speed it was saved at.

The manual for BASIC-G gives the impression that you must save Basic programs by using LIST "name". This isn't necessary—SAVE will do the job just as well, and much faster.

The advantages of using LIST, however, are that only certain lines need to be saved, if required and, more importantly, programs can be merged. For instance, you could save a frequently used subroutine with LIST, and then OLD it whenever you need it. The merged program lines will replace anything with the same number in memory, so it is best to have your subroutine renumbered to, say, 10000 onwards.

Another advantage of files saved with LIST is that they





will be listed on verifying as well as loading. This means that even if you have a program in memory, you can list any programs on cassette without losing your current one.

Other functions which the BASIC-G manual omits are: POSTAD(x): this returns the address of sprite post number x; RETL: this returns the current

loop-start line (for example, the line in which the FOR occurs in a FOR-NEXT loop); RDST\$(x): this reads characters off the screen; and TERMC: I can't find out what this does. If you know, perhaps you could contact me at 5 Greenfield Link, Coulsdon Woods, Coulsdon, Surrey CR3 2SW. *A Hinkly*

## DRAGON COLOURS

Here is a short machine code routine for the Tandy Color Computer; it should also work on the Dragon 32, although one section may need to be relocated.

The program allows three new colour sets for the text

screen: orange on black, green on black and black on orange; it slows down listing speed; allows the hi-res screen to remain in command mode; is relocatable, auto-executes, can be immediately switched on or off, and takes up no user memory—it fits into the second page of reserved memory.

To set it up:

- (1) **Run:** 10 FORT = 314 TO 334: READ X: POKE T,X: NEXT 20 DATA 52,55,142,4,0,166,0,132,191,167,0 30 DATA 48,1,140,6,0,37,243,53,55,57
- (2) **Setup interrupts:** POKE 360,1: POKE 361,58 POKE 363,1: POKE 364,58
- (3) **Saveroutine:** CSAVE "FOSFOR", 314,365,314  
To switch off: POKE 314,57 & on: POKE 314,52  
For orange ink/paper: SCREEN 0,1  
For green ink/paper: SCREEN 0,0  
Switch routine on for black paper, off for black ink. To regain text screen after hi-res screen: SCREEN 0. For peculiar effects: POKE 326,X (Try X=Z)

A disassembly of the routine is given below

|      |    |       |                 |
|------|----|-------|-----------------|
| 013A | 34 | 37    | PSHS,X,Y,A,B,CC |
| 013C | 8E | 0400  | LDX #0000       |
| 013F | A6 | 00    | LDA +0,X        |
| 0141 | 84 | BF    | ANDA #BF        |
| 0143 | A7 | 00    | STA +0,X        |
| 0145 | 30 | 01    | LEAX +1,X       |
| 0147 | 8C | 06 00 | CMPX #0600      |
| 014A | 25 | F3    | BLO \$013F      |
| 014C | 35 | 37    | PULSCC,B,A,Y,X  |
| 014E | 39 |       | RTS             |

Disassembly routine

*Jeffrey R Burrows*

## FORTH ERROR REPORTING

Here is a word which will improve error reporting and aid in the debugging of applications written in Acornsoft Forth. It works on the BBC but I see no reason why it should not function

on Electron Forth, or even Atom Forth.

The word, ABORT", checks the stack and if a true value (1) is found, prints an error message, clears the computation stack, and returns to the keyboard interpreter via (WARM). Note that if you want to preserve the contents of the stack after an ABORT", omit

the line which says: COMPILE SP!

If the value passed to ABORT" is false, that is, zero, execution continues normally.

Here is the definition:

```
: ABORT" (flag ... )
  ?COMP
  [COMPILE] IF
    COMPILE (."
    34 WORD COUNT
    TEXT,
    COMPILE SP!
    COMPILE (WARM)
  [COMPILE] THEN
; IMMEDIATE
```

To illustrate the effect of

ABORT", here is an example. This loop should run from -10 to +10, but when the counter becomes greater than five the loop aborts.

```
: LPTEST 11 - 10 DO I. I
5> ABORT" TOO BIG"
LOOP;
```

The closing quote is only a delimiter and needs no preceding space, rather like the word ".". I have found this to be a very useful definition, as it eliminates the need for IF...ELSE...THEN-type range checks.

*Richard Clarke*

## ORIC ROM CALLS

Here are a few more ROM calls which might be helpful to Oric owners.

The commands without a location may be shortened

by typing DOKE #2F5, location of command.

For example, NEW would be DOKE #2F5, #C71B then typing 'I' would NEW the program in the memory. *TLatham*

| Command | Location | Values passed in |
|---------|----------|------------------|
| PING    | #FA85    |                  |
| HI-RES  | #E9BB    |                  |
| TEXT    | #E9A9    |                  |
| PAPER   | #F17F    | #2E1             |
| INK     | #F18B    | #2E1             |
| NEW     | #C71B    |                  |
| LIST    | #C773    |                  |
| LLIST   | #C824    |                  |
| LPRINT  | #C832    |                  |
| WAIT    | #D89D    |                  |
| GOTO    | #C9AA    |                  |
| CONT    | #C970    |                  |
| RUN     | #C98B    |                  |

## LYNX MULTI-PROGRAMS

Having read RP Freeman's subroutine for saving part of a Basic program on the Lynx (PCW, October, 1983), I realised that it would be possible to move a complete program around the Lynx's memory. The subroutine here does exactly that and is surprisingly fast. DEFPROC MOVE INPUT "New start address of program";A B=DPEEK(&61FA) C=DPEEK(&61FC) FOR N=B TO C POKE A+N-B,PEEK(N) NEXT N PRINT "Moved from('";#B;" upto('";#C;" to('";#A;" upto

```
";#A+C-B;")"
DPOKE&61FA,A
DPOKE&61FC,A+C-B
ENDPROC
```

To use the subroutine, add it to the end of a program and call it with PROC MOVE. The whole program, including the subroutine, will be copied to the specified address. This can be entered as either a decimal number or a hex number by using '&'. When the program has been copied, access will be to the copied version (the original can be re-accessed by DPOKEing the start address (&694D) into &61FA. By entering DPOKE &61FA,DPEEK(&61FC)+n where n = the number of bytes between each program, it is possible to enter several programs and have them all in memory at once. This can be done either





through the keyboard or from tape and the command should be entered before each program. To find the start address of the program, enter  
`PRINT #DPEEK(&61FA).`

Other programs can be re-accessed by `DPOKE` ing &61FA with the start address of the required program.

When using either of the above, remember the following:

(1) `RESTORE` statements should be used in programs where they would not normally be necessary. It's important to include the line

number of the data because otherwise you're likely to get the wrong set of data.

(2) If you wish to adjust programs after storing in a sequence by the second method, space should be left by making the number 'n' fairly large. Otherwise the program immediately after will be corrupted.

(3) Listing memory that contains no Basic programs may result in a lot of junk being thrown up on the screen; this can usually be escaped from with normal listing.

*Leo B Carlyon*

## FASTER SINCLAIR BASIC GAMES

Here is a tip for speeding up games written in Sinclair Basic, and probably most other Basics.

When writing board games or strategic games based on a matrix (*Connect-4*, *Othello*, *Draughts*), it is often necessary for the program to 'scan' a 2 or more dimensional array to check for validity of moves, winning combinations, and so on. How efficiently this is done greatly effects the response time of the game.

Usually, certain conditions must be tested for within the array and, if they are all true, a branch is made to another part of the program.

For example,  
`IFA(N,1)=PANDA(N+1,1)  
=PANDA(N+2,1)=P  
THEN...(BRANCH).`

The problem with this method is that all three conditions are tested, even if the first one is false (which would clearly make the overall condition false). If the above statement were to appear within one or nested `FOR...NEXT` loops, then considerable time would be wasted.

The example statement should be altered to:  
`IFA(N,1)=P THEN IFA(N+1,  
1)=P THEN IFA(N+2,1)  
=P THEN...(BRANCH).`

This may be considered bad programming practice, but by using it a condition is only tested if the previous one was true. By structuring the statement so that the least likely event is tested for first, a further reduction in scanning-time will be noted.

Using this technique, I have measured reductions in response time of up to 48%. That could mean the difference between a game being playable, or downright unbearable.

*VJ Chittenden*

## COMMODORE HINTS

Normally, when `NEW` ing a program, the program written in Basic is cleared but not machine code, so one command can erase the entire RAM.

The following line:  
`SYS 64738`  
will erase all Basic listings and leave the machine code program (if any) on top of the RAM. It helps if you keep your

finger away from the on/off button!

The Commodore 64 keyboard can be programmed to repeat graphics by typing:  
`POKE 650,255`  
and can be reset by  
`POKE 650,0`

The `LOAD` command appears automatically by pressing `SHIFT+RUN/STOP` but can be programmed to execute or load a nameless program (merge), by  
`SYS 63478`  
which will display

`LOAD  
PRESS PLAY...` on the screen.

Other useful tips include  
(a) disabling the `LIST` statement in a program which is made possible by:  
`POKE 775,200`  
and  
`POKE 775,167`  
will allow `LIST` (resetting),  
(b) disabling the keyboard which is made possible by:  
`POKE 198,0`  
(c) colour `INK` printing:  
`POKE 646,X`

where `x=1` then ink colour=white  
`x=2` then ink colour=red  
`x=3` then ink colour=cyan  
`x=4` then ink

colour=purple  
and so on  
`POKE 646,2` will change the cursor and print colour(s) to red.  
(d) `POKE 53272,99` will switch all characters (letters) to upper case.  
(e) `POKE 53272,31` will switch to lower case.  
(f) `SYS 64739` will not allow any entry—it disables every key on the board and only by switching off will you get access to the keyboard.  
(g) `FRE` and any number in brackets will give you the number of bytes left in the memory and the syntax for `FRE` is:  
`PRINT FRE (x)` where `x` is any number.  
*Abbiyyu Lulseggad*

## MACHINE CODE NUMBERS CHECK

Many of the programs in *PCW* contain lists of numbers. These have been carefully generated by the authors and are vital to the operation of the program.

I have on several occasions typed in such a list of values only to find that the program does not run correctly. The

cause of the problem is invariably an error in typing the values. It would be very helpful if some mechanism could be added to these programs to check the validity of the data.

A simple way to perform such a check is to sum the data as it is read. In order to make it easier to find the number in error, the sum should be checked about every 10 times. The program below is an example of how a data initialisation routine could be coded.

*DJ Roberts*

```
5 REM This program fills array x from the data starting at
500
10 DIM x(34) : RESTORE 500 : REM prepare array and data
20 LET s=0 : LET c=0 : REM Prepare sum and element
counter
30 FOR i=1 TO 34
40 READ v : c=c+1 : REM Get next data and increment
sum counter
50 IF c<11 LET x(i)=v : LET s=s+v : GOTO 80 : REM
Normal data value
60 LET i=i-1 : LET c=0 : REM Correct array place and
zero sum counter
70 IF s<>v GOTO 200 : REM Sum should match value
from DATA
80 NEXT i
90 READ v : REM Final check at the end of the list
100 IF s<>v GOTO 200 : REM The last part of the data was
bad
110 PRINT "Array x correctly loaded" : END
200 PRINT "ERROR on line"; 500+INT((i-1)/10)*10 : END
500 DATA 164,56,142,109,185,30,131,87,40,216,1160
510 DATA 42,178,230,8,241,148,145,3,245,225,2625
520 DATA 152,55,148,238,117,1,78,240,253,131,4038
530 DATA 255,179,123,113,4708
```

This program will not detect all errors but should help with the most common errors; mistyped digits, missing data values and missing DATA lines.  
*Simple Checksum Program*



# COMPUTER ANSWERS

*Send your queries to Tony Hetherington, PCW, 62 Oxford Street, London W1.  
Note that Tony cannot answer questions on an individual basis, so please  
don't send an SAE with your query.*

## Projected sales figures

I am writing a school project about the computer industry and the way in which it has boomed recently.

However, I need some facts and figures to help me complete this.

(1) How has the amount of software sold in Britain increased in the past five years?

(2) How do you expect software sales to increase/decrease in the future?

(3) How has the number of micros sold in the UK increased over the past five years?

(4) Approximately what percentage of computer owners use video game type software on their micros?

(5) Does the software industry have any future. If so, in what direction will it take us?

AP Tompkins, Purley, Surrey

(1) It is very difficult to give hard facts about software sales in the computer industry as the only source for this information are the software houses themselves. This confusion over levels of sales is illustrated by the number of games charts available, none of which can agree on more than a few chart positions.

(2) Undoubtedly software sales have boomed in the past five years, ever since the introduction of the Sinclair ZX81 into an otherwise expensive market. However, growth is now levelling out as the software buyer becomes more discerning and demands quality for his money.

(3) This levelling out has resulted in the demise of some companies and warnings that others will follow. However, successful companies producing only a handful of quality products a year are far from pessimistic and are looking forward to Christmas and the continuing expansion of the hardware and software markets.

(4) There is no doubt that the majority of computer owners have at least one game in their software library but this is rarely the sole use nor are the games as predictable as their video game counterparts.

Indeed, there is a general move towards better and cheaper software which will ensure the continuing future of the software industry.

(5) The growth in hardware sales has mirrored the software development, and computer manufacturers confidently predict record sales this Christmas.

Finally, if figures on the business market alone are of interest, a market research company called EIU Informatics has recently released the results of its own survey. This puts dBase II at the top, followed by Multiplan, VisiCalc and WordStar.

## Paging the Enterprise!

In *PCW*, July 1982, page 85 ["EXPANDA-BEEB"], the author writes 'The maximum amount of memory which one 8-bit processor can address is limited to 64k — and this has to include both ROM and memory-mapped input/output, as well as RAM.' He goes on to say 'One possible means of improving on this... is the capacity for accessing an extra 64k of RAM, ROM or I/O in a "paged" mode'... but goes on to explain that 'This is much slower than accessing the onboard RAM.' Finally, he explains that with a second processor, these restrictions are immediately lifted. (An extra 64k is immediately available if the second processor is 8-bit; and if the second processor is 16-bit, 'you are into the megabyte region in terms of memory capacity'.)

Both the Amstrad CPC464 and the forthcoming Enterprise microcomputers [64k and 128k] have (as far as I know) only a single processor — the Z80A — and I understand this to be an 8-bit processor. Yet, in its brochures, Amstrad claims that the CPC464 is capable of adding an 'additional RAM of up to 8160k' and Enterprise claims that with both the 64k model and the 128k model, the RAM is expandable up to 3968k.

Can you explain how this Z80A processor can be made to address so very much more than the 64k + 64k described in EXPANDA-BEEB?

Will the extra RAM be addressed in a 'paged' mode?

Will this take longer than when addressing less than 64k?

When programming, will one be able to remain unaware of how much memory is being addressed. Or will one, on the contrary, have to use special programming techniques or operating techniques which are unnecessary when addressing less than 64k?

Daniel Reichenberg, Ealing, London

Such a memory expansion capability is achieved by organising the RAM into pages of 64k each. These are then paged in when they are required by the user. This is all done for you by RAM support chips and software; as far as you are concerned the machine can access the total memory.

The theoretical maximum RAM available would, therefore, be 64 pages of 64k which works out to be just under 4.2 megabytes. Enterprise's claim of 3.9 megabytes is credible but the company hasn't disclosed the cost of such a massive system.

The system you describe lacks these paging facilities and is restricted to the 64k available to each of the processors.

It is unlikely that the paging of this memory will have a significant effect on running speeds as such processes are completed in micro seconds. Take, for example, the Benchmarks for the Memotech RS128 Benchtest (see page 168) which illustrate this point well.

## 'Rare breed' of cat

I am one of those rare breed of micro owners who purchased a 48k Lynx. As is the case with all micros I could write glowing reports of its good points and similarly criticise its failings.

Unfortunately, for myself and the other purchasers of this brand, we appear to be left in the void as Computers struggles through its final agonies.

Being totally ignorant of electronics I wonder: is it at all possible to replace the Lynx

ROMs with some other Z80-based system ROMs in order to fool the hardware into thinking that it is something else. This would allow the machine to be expanded with surrogate peripherals as and when required. Or, must I throw away this micro and purchase another system if Computers fails (or has it already)?

If feasibility is confirmed, could someone suggest a suitable ROM.  
FGM Ford, Stanford-le-Hope, Essex

I'm afraid that you're asking the impossible as not only do these machines have different ROMs but their circuit boards are completely different as well. It would be possible to relace the ROM chips but you would have to totally rewire the entire circuit board. This would be an impractical task for anyone to undertake and could easily cost you more than the price of a new computer.

Unfortunately, Computers has failed and there do not seem to be any plans to relaunch the company or the machine.

However, I have passed your name on to some other Lynx owners who may be able to help you make the most of your machine.

## It's all in a name

Recently I saw an Atari 800 and an Atari 800XL for sale. Could you please explain the difference between the two and say which is the better buy?

Pauline Walton, Southampton, Hants

The Atari 800 and Atari 800XL are very closely related, although there are some minor differences.

(1) The 800XL has so-called '64k' though no more is available to Basic.

(2) Some minor bugs in the 800 operating system have been corrected on the XL. This means that software that accesses the operating system directly will not work.

However, Atari provides an 'official' way to access the OS and over 90 per cent of software uses this and will run OK. Disk drive users can boot in the old Atari operating system giving total compatibility with



all software.

(3) The XL has two joysticks compared with four on the 800, meaning that the few pieces of software that use four will not work nor will certain printer interfaces which use ports 3 and 4.

(4) The XL has Basic and some gimmicky 'Self Test routines' built-in, whereas Basic comes on cartridge on the old 800.

This means that Basic must be disabled when loading machine code games from tape, by pressing both the "OPTION" and "START" simultaneously when switching on the machine.

(5) Finally, the XL has a processor bus expansion, Spectrum-style, giving greater scope for expansion. Also the unused second cartridge slot has been dropped. At the moment the only thing to fit this expansion port is Atari's own 64k to turn a 600XL to an 800XL.

Overall, I would recommend the 800XL as it is likely to have more of its additional features incorporated in future software. However, if the 800 is a lot cheaper it would still be a viable buy.

## Joining in the demonstration

I have recently bought a 1541 disk drive to go with my Commodore 64 and was delighted to see that it was accompanied by a demonstration disk. Unfortunately, the manual contained no explanation of the programs on the disk or their uses. In fact, apart from a couple of listings in the back, the programs are not mentioned at all.

Could you please explain the uses of these programs or should I "NEW" the disk and use it with EasyScript. R Fowler, Loughborough, Leics

The programs on the demo disk do, in fact, contain some useful utilities which you may wish to include in your programs. By far the most useful is the C-64 Wedge which greatly accelerates program development.

Here's a full list of the programs with a brief explanation and an indication of their worth:

### Printer test

This program prints a listing of the character set to allow checking of the printer mechanism.

### Display T and S

By specifying the track and sector of a block, the contents of a block can be examined on either screen or printer. The

contents are displayed in hex. There is also the facility to examine subsequent blocks once loaded.

### Check disk

This program writes to every block on the disk to check whether or not it will store data. It records any bad blocks so that the DOS will not use them. This test should be run just after formatting a new disk.

### Performance test

This tests the mechanical and electrical capabilities of the drive. It does this by:

- (1) NEWing the disk.
- (2) Creating and reading a sequential file.
- (3) Creating and reading a random file.
- (4) Reporting any errors.

### C-64 wedge

This loads the program DOS 5.1 into memory. It is a useful aid in program development and provides the following features:

- (1) Programs can be LOAded using the format/progname

This saves having to type LOAD "progname", 8 all the time. It can also be used in conjunction with the pattern matching characters '\*' and '?'.  
(2) '@' and '>' are used to preface disk commands. '>\$' or '@>\$' will display the disk's directory without losing the program currently in memory.

- (3) After a disk error (a flashing red light on the drive) '@' or '>' followed by RETURN will display the error message on the screen.

This program can be saved in with your own program using the following sequence of commands:

```
POKE 44,204:POKE 43,0
POKE 46,207:POKE 45,89
SAVE "DOS 5.1",8,1
```

The DOS can then be reloaded using LOAD "DOS 5.1",8,1.

COPY ALL and DISK ADDR CHANGE are used together to provide an easy method of backing up your disks. The only drawback is that you need two disk drives. The DISK ADDR CHANGE program is used to alter the device number of one of the disk drives. This is essential if you are using more than one drive in a program.

DIR allows you to:

- (1) See the directory.
- (2) Use > or @ as in the wedge program.
- (3) Give the status of the disk by printing the error channel (00,OK,00,00 if no error).

The other programs on the demonstration disk are:

*How To Use*—an introduction to the programs on the disk;  
*V-20 Wedge*—a wedge program for the VIC-20; and  
*View BAM*—a program that draws a diagram of the BAM very slowly and then clears the screen before you have a

proper chance to look at it.

Finally, there are two programs that illustrate how to create and use sequential and random files. These can be used as a core for your own programs.

## Going up the wall

I have just received the Basic Converter Wallchart and was concerned to note that the Sirius was omitted from it. Could you give me the necessary information so that I may include it in my copy?  
Ron Westerman, Exeter, Devon

The Sirius can easily be included in the same column as the IBM Basic A. There are only a few differences between the Basics which are listed below.

```
CLEAR [exp,exp]
GET [#]<file number>[,<rec number>]
LIST [lineno][-[lineno]]
LLIST [lineno][-[lineno]]
ONexp GOSUB
OPEN <mode>,[#]<fileno>[,<rec length>]
```

## Sharp answer

Information we've received from the BBC should help to answer some of the numerous questions we've received on Basicode.

BBC Support Services is releasing new, improved versions of Basicode in September. The machines covered are the Apple II, BBC, CBM 64, Pet, Vic-20, Dragon 32/64, MSX, Oric 1/Atmos, Electron, Sharp MZ80-A/K, Spectrum, TRS 80 1/11 and Video Genie. It is also looking at ways to help existing Basicode users, with one of the options being replacing old versions with new ones.

David Loverseed of David Computer Software has also

written in with some advice for Sharp owners:

In *Computer Answers, PCW*, September, Trevor Escott wrote regarding Basicode for Sharp computers. Having collaborated with the BBC in producing the latest version, perhaps I can add to the answer given.

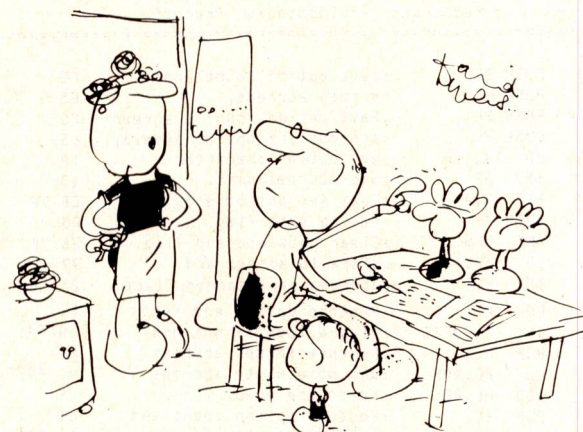
BBC Broadcasting Support Services of 252 Western Avenue, London W36XJ, supplies Basicode converters for the Sharp MZ-80A and MZ-80K, a handbook, and cassette of sample Basicode programs. A converter for the Sharp MZ-700 is available from my company, DCS, of 38 South Parade, Bramhall, Stockport, SK73BJ. All three converters take the form of 'toolkits' which are loaded after, and modify Basic to handle Basicode, the loading method being:

1. Load BASIC
  2. Type BYE (MON on the MZ-80A) and press CR
  3. Insert the Basicode cassette, type L and press CR, then PLAY as prompted
- As Trevor noted, only half the tape is read; this is the case with all standard Sharp cassettes, as Sharp computers record programs twice without this being apparent to the user. If a bad read is obtained, the second recording is read automatically.

Once the toolkit is loaded, the Sharp will load and save both Basic and Basicode programs, the extra commands LOAD/B 1000— and SAVE/B being used for Basicode. The use of LOAD/B on its own, as referred to in your answer, is not recommended, since lines 1000 on are machine-specific and added to the program after loading by the command LOAD/2.

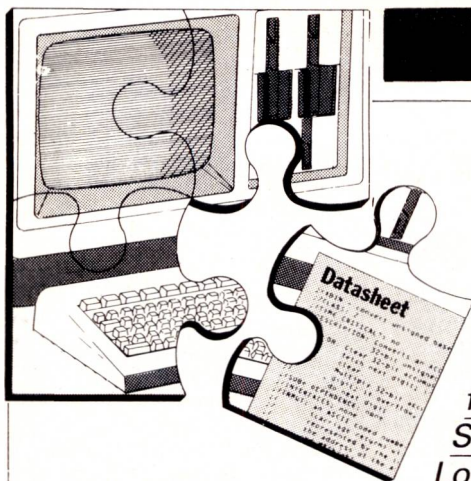
DLoverseed, David Computer Software

END





# SUBSET



David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Sub Set, PCW, 62 Oxford Street, London W1A 2HG.

## Z80 LISTED OPTIONS

To save you having to continually type in execute commands, MENU from Geoffrey Ticehurst of Lutterworth lists the options

available to you. It prompts your selection with a moving arrow and passes control to the program of your choice.

Although written for the TRS-80 keyboard input system, you should find that it will easily convert to the system used by your own computer.

### DATASHEET

```
=====
:= MENU      Menu option select routine.
=====
:JOB          To display options, seek user choice and pass
:              control to option program.
:ACTION       Print options and address top option.
:              REPEAT UNTIL space bar pressed:
:              [ Highlight current option.
:              IF down-arrow pressed THEN:
:              [ De-highlight current option and address
:              next wrapping from bottom to top option. ]
:              Jump to chosen option through jump table.
=====
:CPU          Z80
:HARDWARE     TRS-80 Model 1 Keyboard buffer, and display.
:              Memory containing option list.
:SOFTWARE     "UNKEY" - local subroutine, to wait key release.
=====
:INPUT        HL addresses screen RAM options destination.
:              DE addresses the first byte of the option list.
:              B = number of options.
:              Each option must have bit 7 of the end byte set.
:              Option jump table of 3-byte JP instructions must
:              follow immediately after CALL MENU.
:OUTPUT       All registers changed. Control is passed to the
:              program section dealing with the wanted option.
:ERRORS       No check for option list running off screen.
:REG USE      AF BC DE HL
:STACK USE    10
:RAM USE      None.
:LENGTH      81
:CYCLES       Not given.
=====
:CLASS 2      -discreet *interruptable *promable
:              -reentrant -relocatable -robust
=====
MENU  PUSH BC      :Save option count and      C5
      PUSH HL      :screen address.            E5
MENUA  PUSH BC      :Save option count & screen  C5
      PUSH HL      :address for option display. E5
POPTS  LD  A,(DE)   :Get option character       1A
      INC  DE       :and address next.         13
      BIT  7,A       :Test for option end,      CB 7F
      PUSH AF       :saving test flag.         F5
      AND  7FH       :Clear possible end flag,  E6 7F
      LD  (HL),A     :store to screen and      77
      INC  HL        :address next screen place. 23
      POP  AF        :Restore option end test   F1
      JR  Z,POPTS    :flag & loop if not end.   28 F4
      POP  HL        :Restore screen address   E1
      LD  BC,40H     :and move HL to address  01 40 00
      ADD  HL,BC     :next line down.         09
      POP  BC        :Restore option count and  C1
      DJNZ MENUA     :repeat for all options.  10 EA
      POP  HL        :Restore top line address E1
      DEC  HL        :Address place 2 chars to 2B
      DEC  HL        :left for arrow position. 2B
=====
```

```
POP  BC      :Restore option count,      C1
LD  C,B      :saving it in C.           48

:
MENUB  PUSH HL :Save top line address.    E5
MENUC  LD  (HL),5EH :Display right arrow and 36 5E
      LD  A,(3840H) :get any keyboard input. 3A 40 38
      BIT  7,A       :Test for space-bar and  CB 7F
      JR  NZ,MENUB   :exit MENUB if pressed. 20 13
      BIT  4,A       :Test for down arrow and CB 67
      JR  Z,MENUC    :repeat if not.        28 F3
      CALL UNKEY     :Wait down arrow release. CD 10 hi
      LD  (HL),20H   :Clear right arrow from 36 20
      LD  DE,40H     :display and address next 11 40 00
      ADD  HL,DE     :line down, repeating if 19
      DJNZ MENUC     :bottom option not passed. 10 E8
      POP  HL        :Else get top line address E1
      LD  B,C        :and option count then  41
      JR  MENUB      :restart on top option.  18 E3

:
MENUD  CALL UNKEY   :Wait space-bar release.  CD 10 hi
      POP  HL        :Tidy up stack.         E1
      LD  A,C        :Compute: options - options 79
      SUB  B         :missed = option index.   90
      LD  B,A        :Multiply option index    47
      SLA  A         :by 3 for 3-byte JP      CB 27
      ADD  A,B       :instructions.          80
      LD  B,0        :Move offset to required JP 06 00
      LD  C,A        :into BC, get return address 4F
      POP  HL        :as jump table base address, E1
      ADD  HL,BC     :add offset to address JP  09
      JP  (HL)       :instruction and jump to it. E9

:
: ...Wait for release of key being pressed.
UNKEY  LD  A,(3840H) :Get key store and test if 3A 40 38
      OR  A          :any bit set = key pressed. 87
      JR  NZ,UNKEY   :Repeat until none pressed 20 FA
      RET           :then return to MENU.      C9
=====
```

## 6502 CONTROL LISTING

Code dump routines sometimes print the ASCII characters alongside the hex, in case data and not machine code is coming through.

Control codes are usually skipped or printed as spaces. CTRPRT from Tim Herklots of Farnham intercepts these codes on their way to the print routine, and prints the standard two- or three-letter abbreviations. The result—readable hex dumps.

### DATASHEET

```
=====
:= CTRPRT     Control character name print.
=====
:JOB          To intercept an ASCII control code destined for
:              a print routine, converting it to its three
:              letter abbreviation enclosed in brackets.
:ACTION       IF character is a control code, THEN:
:              [ Use code * 3 as index to abbreviation table.
:              Copy abbreviation to stack. Put "<" on stack.
:              FOR count of 4:
:              [ Pull byte. IF NOT "*" THEN: [ Print. ]. ]
:              Set character = ">".
:              Exit to Print routine.
=====
:CPU          6502
:HARDWARE     None.
:SOFTWARE     "WRCHAR" - subroutine to print ASCII char. in A.
=====
:INPUT        A contains ASCII character or control code.
```



```

:OUTPUT      If input is a character ($20+), A is unchanged.
:            If input is a control code, output A = ">".
:ERRORS      None.
:REG USE     A P
:STACK USE   4
:RAM USE     M0
:LENGTH     146 (Code: 50. Data: 96).
:CYCLES      Not given.
=====
:CLASS 2     -discreet *interruptable *promable
:-----*    *reentrant *relocatable *robust
=====
:
CTRPT CMP #32      :Pass straight through if      C9 20
BCS CPEND         :not a control code.            B0 2B
STA M0           :Else code table offset         85 M0
ASL A            :is 3 * code number.             0A
ADC M0           :                               65 M0
STX M0           :Save X and move offset          86 M0
TAX             :to X as code index.             AA
LDA CTAB+2,X     :Get last letter                 BD 10 hi
PHA             :to stack.                       48
LDA CTAB+1,X     :Get middle letter               BD 10 hi
PHA             :to stack.                       48
LDA CTAB,X       :Get first letter                BD 10 hi
PHA             :to stack.                       48
LDA #$3C         :Get LESS-THAN symbol            A9 3C
PHA             :to stack.                       48
LDX M0           :Restore X.                      A6 M0
LDA #4           :Get count of stacked            A9 04
STA M0           :letters in M0.                  85 M0
CPLP PLA        :Get character off stack          68
CMP #42         :but if "*" space filler          C9 2A
BEQ CPLTST      :then miss printing it.           F0 03
JSR WRCHAR      :Go print character.              20 10 hi
CPLTST DEC M0    :Repeat for four stacked         C6 M0
BNE CPLP        :characters.                     D0 F4
LDA #$3E        :End with GREATER-THAN.          A9 3E
CPEND JMP WRCHAR :Exit to print last char.        4C 10 hi
:
CTAB .BYTE 78,85,76,83,79,72 :NUL SOH      4E 55 4C 53 4F 48
      .BYTE 83,84,88,69,84,88 :STX ETX      53 54 58 45 54 58
      .BYTE 69,79,84,69,78,81 :EOT ENQ      45 4F 54 45 4E 51
      .BYTE 65,67,75,66,69,76 :ACK BEL      41 43 4B 42 45 4C
      .BYTE 66,83,42,72,84,42 :BS* HT*      42 53 2A 48 54 2A
      .BYTE 76,70,42,86,84,42 :LF* VT*      4C 46 2A 56 54 2A
      .BYTE 70,70,42,67,82,42 :FF* CR*      46 46 2A 43 52 2A
      .BYTE 83,79,42,83,73,42 :SO* SI*      53 4F 2A 53 49 2A
      .BYTE 68,76,69,68,67,49 :DLE DC1      44 4C 45 44 43 31
      .BYTE 68,67,50,68,67,51 :DC2 DC3      44 43 32 44 43 33
      .BYTE 68,67,52,78,65,75 :DC4 NAK      44 43 34 4E 41 4B
      .BYTE 83,89,78,69,84,66 :SYN ETB      53 59 4E 45 54 42
      .BYTE 67,65,78,69,77,42 :CAN EM*      43 41 4E 45 4D 2A
      .BYTE 83,85,66,69,83,67 :SUB ESC      53 55 42 45 53 43
      .BYTE 70,83,42,71,83,42 :FS* GS*      46 53 2A 47 53 2A
      .BYTE 82,83,42,85,83,42 :RS* US*      52 53 2A 55 53 2A
=====

```

## 6502 SQUASH

Routines to compress and expand Z80 data held to 12-bit accuracy were given in the June issue.

David Heale of Bolton has converted them to 6502 code. David's SQSH preserves the

source data, unlike the Z80 version.

As both routines use post-indexed addressing, the pointers (in M0 to M3) are unchanged. Any loop repeatedly calling them to deal with a long data list will have to increment them to the next four- or three-byte block.

## DATASHEET

```

=====
:= SQSH      Squash Data.
=====
:JOB        To compress two 16-bit words of numerical data,
:            held to 12-bit accuracy, into 3 bytes.
:ACTION     Move source byte 1 to destination byte 1.
:            Discard s2-hi. Move s2-lo to d2-hi.
:            Move s3-hi to d2-lo. Move s3-lo to d3-hi.
:            Discard s4-hi. Move s4-lo to d3-lo.
=====
:CPU        6502
:HARDWARE   RAM: 4 bytes source, 3 bytes for destination.
:SOFTWARE   None.
=====
:INPUT      M0,1 addresses first byte of 4-byte source.
:           M2,3 addresses first byte of 3-byte destination.
:OUTPUT     M0,1 & M2,3 and source data are unchanged.
:           Y = 3. A = last squashed byte.
:ERRORS     No check for destination overwrite of source.
:REG USE    A Y P
:STACK USE  None.
:RAM USE    M0 M1 M2 M3
:LENGTH    41
:CYCLES     98
=====

```

```

=====
:CLASS 2     -discreet *interruptable *promable
:-----*    *reentrant *relocatable *robust
=====
:
SQSH LDY #0      :Index first bytes.              A0 00
LDA (M0),Y     :Move source 1                    B1 M0
STA (M2),Y     :to destination 1.                 91 M2
INY           :Index second bytes.                CB
LDA (M0),Y     :Get source 2,                     B1 M0
ASL A          :lo-nibble                          0A
ASL A          :into A                             0A
ASL A          :hi-nibble                          0A
ASL A          :and store                          0A
STA (M2),Y     :in destination 2.                 91 M2
INY           :Index third bytes.                 CB
LDA (M0),Y     :Get source 3,                     B1 M0
LSR A          :hi-nibble                          4A
LSR A          :into A                             4A
LSR A          :lo-nibble                          4A
LSR A          :and merge                          4A
DEY           :indexing second byte               88
ORA (M2),Y     :with s2 lo-nibble                 11 M2
STA (M2),Y     :and store in destination 2.        91 M2
INY           :Index third bytes.                 CB
LDA (M0),Y     :Get source 3,                     B1 M0
ASL A          :lo-nibble                          0A
ASL A          :into A                             0A
ASL A          :hi-nibble                          0A
ASL A          :and merge                          0A
INY           :indexing fourth byte               CB
ORA (M0),Y     :with s4 lo-nibble.                 11 M0
DEY           :Index third byte and store          88
STA (M2),Y     :in destination 3.                 91 M2
RTS           :Exit, data compressed.             60
=====

```

```

=====
:= EXPD      Expand Data.
=====
:JOB        To expand 3 bytes of numerical data, compressed
:            by "SQSH", back to two 16-bit words with the
:            four most significant bits of each set to zero.
:ACTION     Move source byte 1 to destination byte 1.
:            Move s2-hi to d2-lo. Clear d2-hi.
:            Move s2-lo to d3-hi. Move s3-hi to d3-lo.
:            Move s3-lo to d4-lo. Clear d4-hi.
=====
:CPU        6502
:HARDWARE   RAM: 3 bytes source, 4 bytes for destination.
:SOFTWARE   None.
=====
:INPUT      M2,3 addresses first byte of 3-byte source.
:           M0,1 addresses first byte of 4-byte destination.
:OUTPUT     M0,1 & M2,3 and source data are unchanged.
:           Y = 4. A = last expanded byte.
:ERRORS     No check for destination overwrite of source.
:REG USE    A Y P
:STACK USE  None.
:RAM USE    M0 M1 M2 M3
:LENGTH    42
:CYCLES     100
=====

```

```

=====
:CLASS 2     -discreet *interruptable *promable
:-----*    *reentrant *relocatable *robust
=====
:
EXPD LDY #0      :Index first bytes.              A0 00
LDA (M2),Y     :Move source 1 to                   B1 M2
STA (M0),Y     :destination 1.                     91 M0
INY           :Index second bytes.                 CB
LDA (M2),Y     :Get source 2,                     B1 M2
LSR A          :hi-nibble into                     4A
LSR A          :lo-nibble A,                       4A
LSR A          :clearing hi-nibble                 4A
LSR A          :and store in                       4A
STA (M0),Y     :destination 2.                     91 M0
LDA (M2),Y     :Get source 2,                     B1 M2
ASL A          :lo-nibble                          0A
ASL A          :into A                             0A
ASL A          :hi-nibble A,                       0A
ASL A          :clearing lo-nibble A,               0A
INY           :index third bytes                   CB
STA (M0),Y     :and store in destination 3.        91 M0
LDA (M2),Y     :Get source 3,                     B1 M2
LSR A          :hi-nibble                          4A
LSR A          :into A                             4A
LSR A          :lo-nibble A                        4A
LSR A          :and merge with                     4A
ORA (M0),Y     :s2-lo, then store                  11 M0
STA (M0),Y     :in destination 3.                 91 M0
LDA (M2),Y     :Get source 3 lo-nibble,            B1 M2
AND #$0F       :clearing hi-nibble,                29 0F
INY           :index fourth byte                   CB
STA (M0),Y     :and store in destination 4.        91 M0
RTS           :Exit, data expanded.                60
=====

```





# Time for the show-down

*Yes, it's PCW show-time, folks; Jerry Sanders raises the curtain at Olympia and invites you to step inside . . .*

When you get to the Show and wonder where to start, try the Leading Edge feature on the PCW stand. The PCW team has put together a display of the most innovative products on the market, setting the scene for all that's best in microcomputing in 1984 — and that includes the QL, the Hewlett-Packard touch-screen machine, the new portable Apricot from ACT, together with Ashton Tate's Framework software and Lords of Midnight from Beyond.

Among the many firsts at the Show will be Acorn's range of seven machines under the ABC designator (Acorn Business Computer), plus the award by the British Standards Institute of the certificate marking A1 validation of Acornsoft Pascal. This is the first ROM-based Pascal that's ever approached validation quality, and also the first ISO 7184 level one Pascal implementation on any micro-computer. Watch out too for Sherlock Holmes and the new Mega-Game Time Race, commissioned by Domark from Andromeda and a team of Hungarian programming Wizards.

Graphics enthusiasts should look out for the winners of the PCW Micro-

Animation Competition. Entries from home and abroad to a high standard compete for the top prize of a Fujitsu 16-bit micro, with a host of other prizes from Sinclair, Oric, Atari, Tradecom, Microvitec, Hantarex and Century Publications. The winners' handiwork on a variety of machines is on display at the PCW stand, and prizes will be presented at 4pm on Friday 21 September.

Also on display will be the much-renamed Enterprise. Yes, the machine you haven't been buying QLs for finally sees light of day with a full range of Enterprise-branded peripherals and software.

Media presence this year is greater than ever, with a Radio Four *Chip Shop* studio specially built inside the exhibition hall. *Chip Shop* shot to top audience ratings in its first year, and the PCW Show heralds the first Radio One billing for the series when the Mark Page show carries a Show report on Saturday 22 September at 7.30am. Radio Four plans include three regular slots every Show day, featuring interviews, panel sessions and a special slot for younger listeners.

A must for all games enthusiasts is

the Top Twenty stand. This games arcade will have every one of the twenty best games set up and ready for you to play. Details of machine compatibility, price and chart positions will be kept up to date throughout the Show.

Finding the right books can be a headache, but not for visitors to the Mastering the Micro feature. From the hundreds of titles submitted, experts chosen by the Book Marketing Council have selected the 40 books no micro owner can afford to ignore.

Business users mustn't miss a free session at the Business Advisory Centre. Impartial advice from professional consultants on products and services will be available. Why not get your questions together in advance and save yourself the £50 an hour-plus that an equivalent service might cost you after the Show!

**Every effort has been made to ensure the accuracy of the following entries. However, as the details were compiled before the Show, we would like to apologise for any changes made between going to press and the event itself.**

**ACT** Stand No 721  
Shenstone House  
Dudley Road  
Halesowen

ACT's first public showing of the Apricot F1, F1E and Portable computers, and the Apricot Point 7 and Point 32 network systems, all of which make ACT a UK leader with what is claimed to be Britain's biggest range of business micros. Special features on voice recognition and cordless connections.

**Acorn Computers** Stand No 208  
Fulbourn Road  
Cherry Hinton  
Cambridge CB1 4JN

It's as easy as ABC: that's the theme of Acorn's new range of seven business

machines based on the BBC Micro and its peripherals. The PCW Show is the first showing of the Acorn Business Computer range of two-box machines Z80, 16032 and a third (as yet unnamed) processor chip. Options include 10-20Mbyte winchester disks.

**Addison Wesley** Stand No 706  
53 Bedford Square  
London WC1

New software for Commodore 64; BBC & Electron Colouring Book software. New micro books on graphics, and an IBM PC adventure game book with software, The Secret of Arendarvon Castle.

**Addictive Games** Stand No 1205  
7a Richmond Hill

Bournemouth BH2 6HE

Addictive Games, producer of Football Manager, is exhibiting the new version for the Commodore '64 featuring detailed graphics. Also demonstrated is a new range of games from Silicon Joy. Written by freelance programmers, these games have been specially chosen by Football Manager designer, Kevon Toms.

**Activision UK** Stand No 1033  
15 Harley House  
Marylebone Road  
London NW1 5HE

The opportunity to try out all Activision's latest titles. Come and play Pitfall II, H.E.R.O., Zenji, Toy Bizzare and Beanrider, and try your hand at Desig-



# PCW SHOW 1984

ner's Pencil, a new device for drawing with a joystick.

**Anirog Software** Stand No 1313  
29 West Hill  
Dartford  
Kent DA1 2EL

New games releases for the established and not so established machines, including the Amstrad CPC464 and the MSX breed, plus an adventure preview of Catacombs and Soul Gem of Martek.

**Apple Computer** Stand No 533  
Eastman Way  
Hemel Hempstead  
Herts HP2 7HQ

Apple Macintosh has a fast-growing range of business software, with a level of integration that takes Apple further towards its goal of one person, one computer.

**Argus Press Software** Stand No 1509  
1 Golden Square  
London W1A 3AB

Argus Press Software, the adventure/strategy software company is publicly showing American Football for the first time. Overcoming all the usual constraints of Commodore 64 and Spectrum software, American Football delivers what it promises — a fully animated, live action graphic simulation.

The full range of Computer Tutor, Clever Clogs early learning games are on show, including Sam Safety, the revolutionary road training program.

**Advance Electronics** Stand No 531  
PO Box 230  
Wrexham  
Clwyd LL14 3JR

Advance Electronics is showing its smaller range of Computer Power Conditioners. The new PC-compatible GT40 series and the extended WPC150 range are designed to filter and regulate the mains supply, ensuring complete protection against unpredictable variations in voltage and eliminating 'spikes'. These units are suitable for both home and office use.

**Amstrad Consumer Electronics** Stand No 1103  
Brentwood House  
169 Kings Road  
Brentwood  
Essex CM14 4EF

Amstrad is exhibiting its CPC464 computer and is launching at the Show its new disk drive which comes complete with interface, CP/M and Logo operating system all for £199.95.

**Anagram Systems** Stand No 723  
60A Queen Street  
Horsham  
West Sussex RH13 5AD

Anagram Systems is showing the latest enhancements to its Integrated Accounting System. IAS now offers sales and purchase order processing with full or partial factoring, as well as sales, purchase, stock and nominal ledgers. The full package can perform some 200 accounting functions from just over 50 screen prompts.

**Association of Computer Clubs** Stand No 1525  
ACC Chairman — Rupert Steele  
22 Kemsford Gardens  
London SW5 9LH

The Association came into being officially in February of this year when it took over the national work then being done by the Amateur Computer Club — It's a truly amateur organisation run by enthusiasts in their spare time.

**Atari International (UK)** Stand No 216  
Railway Terrace  
Slough  
Berks

Atari makes its first public appearance since the Jack Tramiel takeover.

**Audiogenic** Stand No 1100  
39 Suttons Industrial Park  
London Road  
Reading RG1 6AZ

See the Koala graphics pad and software for the Commodore 64. Plus, the Audiogenic Swift Spreadsheet system for the Commodore 64 offering Mac-style pop-down menus.

**BBC Radio** Stand No 1343  
Broadcasting House  
Langham Place  
London W1

Visit the BBC Radio stand where a special studio is built to record and broadcast events from the Show live on Radio Four Chip Shop and other BBC radio programmes.

**BBC Publications** Stand No 330  
35 Marylebone High Street  
London W1

A new range of software is being launched including Game Core, Word Mover, Drawstick and Astronomy.

**Bernard Babani (Publishing)** Stand No 1506

Pick up your free copy of the 1984/85 Babani computer book catalogue and see, hot off the presses, *An Introduction*

*To Programming The Sinclair QL.*

**Bicc-Vero Electronics** Stand No 409  
Flanders Road Industrial Estate  
Hedge End  
Southampton SO3 3LG

All the connections you need: circuit boards, card frames, enclosures and housings for the construction of all types of electronic equipment.

**Biodata** Stand No 731  
6 Lower Ormond Street  
Manchester M1 5QG

On show is Microlink, a modular computer interface designed for connecting laboratory instruments to micros. It offers a wide range of modules including analogue digital inputs and outputs, timers and counters, RS232 and Thermocouple inputs. Microlink can operate with most popular micros including IBM, H-P, Apple, Commodore and BBC and software is available for these machines.

**Boot Out** Stand No 908  
PO Box 47  
Putney  
London SW15 1AU

A large selection of business and leisure software for the Apple, Atari, Commodore 64, IBM, BBC and Spectrum are on sale at special Show prices.

**Bubble Bus Software** Stand No 306  
87 High Street  
Tonbridge  
Kent

Bubble Bus Software is showing its latest 3D graphics war game for the Commodore 64, Strike Force, together with Cave Fighter, a prehistoric arcade game. Also Bubble Bus's first Spectrum effort — a conversion of the '64 pool game, Hustler. And don't miss the MSX display.

**BusiSoft** Stand Nos 716 & 718  
2 Seagrave Road  
London SW6 1SF

BusiSoft specialises in applications and technical software for the IBM PC, Apricot, Sirius and Rainbow micros. This year's Show is the first public appearance of its BusiLink database access software, plus demos of Busi-Post for correspondence and mail management, Spellbinder with Word-plus, and Punctuation and Style for sophisticated word processing applications.

**Byte Shop** Stand No 730  
173-175 Drummond Street  
London NW1

If you're looking for advice on how



# PCW SHOW 1984

microcomputers could increase your company's efficiency, then visit the Byte Shop stand. Established for six years, the Byte Shop's portfolio of products comprises the leading names of the industry including IBM, ACT and Comart.

**Cambridge Micro-computer Centre** Stand No 128  
153/154 East Road  
Cambridge CB1 1DD

A type-and-talk speech computer, which includes centronics and serial (RS423) ports, is being demonstrated. Also on offer are a range of quality Teac disk drives and printers at competitive prices, as well as a selection of books.

**Century Publishing** Stand No 1404  
Portland House  
12-13 Greek Street  
London W1V 5LE

Century offers a range of computer books and software with something for everyone.

**Commodore Business Machines** Stand No 202  
675 Ajax Avenue  
Slough SL1 4BG

Two new home computers, the C16 and the Plus/4, grace the CBM stand as well as the upgraded 8000 series for business users. The Commodore 64 communications modem and Compunet, the online service to rival Micronet, are being officially launched.

**Computer Bookshops** Stand No 807  
30 Lincoln Road  
Olton B27 6PA

Books on computers, languages, disk drives, databases, spreadsheets and simulations.

**C/WP Computers** Stand No 410  
Willow House  
Willow Place  
London SW1P 1JH

Information on IBM, Apple, Osborne and Cortex systems, and details of modems and software to turn your micro into a telex terminal.

**Computer and Video Games** Stand No 1203  
Priory Court  
30-32 Farringdon Lane  
London EC1R 3AU

Computer and Video Games adventure expert Keith Campbell is on hand with his computerised Adventure Helpline. Aided by a Tandy computer, Keith and his friends will be answering questions about the popular adventure games.

**Creative Sparks** Stand No 1342  
Thomson House  
296 Farnborough Road  
Farnborough GU14 7NU

There are 15 new games titles on show here, from Danger Mouse heroics, Black Forest Chateau to a graphics/text adventure based on Macbeth.

**CRL** Stand No 1339  
9 Kings Yard  
Carpenter's Road  
London E15 2HD

On display — CRL's most recent release, Magic Roundabout, based on the BBC TV series. The stand also features War of the Worlds and Glug Glug for the Commodore 64.

**Crystal Computing (Design Design)** Stand No 1508  
4 Paton Street  
Manchester M1 2BA

Design Design (formerly Crystal Computing) is attending the Show to launch its new game Darkstar. Written by Simon Bratell for the Spectrum 48k, it looks like being one of the most interesting games of the year. For the Commodore 64 there are Halls of Things and the Zeus Assembler.

**Currah Computer Components** Stand No 329  
26a Danbury Street  
London N1

Currah launches its latest speech synthesiser for the CBM 64, and follows up with a sneak preview of the Micro-Source Forth/Assembler for the Spectrum. Also there — Currah's award winning MicroSpeech for the Spectrum together with the MicroSlot expandable motherboard.

**Data Products** Stand No 743  
Data Products House,  
136-138 High Street  
Egham  
Surrey TW20 9HL

Data Products has recently introduced the Paper Tiger 8000 series of micro-computer printers. These dot matrix machines feature a unique printhead design, and a method of forming characters which produce letter quality printing normally associated with more expensive daisywheel printers. They offer multiple print speeds, graphics and full colour capability.

**Digital Equipment** Stand Nos 405 & 433  
Marketing Comms  
PO Box 110  
Reading RG2 0TR

Digital is showing a range of business

solutions in cooperation with its third party companies. It feels that customer support is one key to success in the personal computer market and is strongly emphasising this at the Show.

**Dimension Graphics** Stand No 1308  
Main Street  
Chackmore  
Buckingham MK18 5JF

Dimension is demonstrating its system for producing A3 full colour prints using its state-of-the-art ink-jet printer (Tektronix 4691). At present this service is available for BBC, Electron and Spectrum with others in the pipeline.

**Disking International** Stand No 428  
Liphook  
Hampshire GU30 7EJ

Disking claims to ship all floppy disk orders within four working hours, and is selling floppy disks at half price for this Show only.

**Domark** Stand No 1200  
228 Munster Road  
London SW6 6AZ

A prize of £25,000 is being offered to the first person who can unravel the mysteries and puzzles of a series of five real-time adventures and arcade games entitled 'Eureka'.

**Duckworth Publishers** Stand No 746  
The Old Piano Factory  
43 Gloucester Crescent  
London NW1

On display will be books for all popular home computers covering a wide range of interest: user manuals, graphics, machine code and adventure games.

**Ebury Software** Stand No 101  
National Magazine House  
72 Broadwick Street  
London W1V 2BP

Ebury Software is showing its *Good Housekeeping* range of Mr T early learning software for pre-school age children.

Previews will be shown of Ebury's new range of practical software products including garden planning, cookery and knitting.

**Elite Systems** Stand No 1404  
55 Bradford Street  
Walsall  
West Midlands

Elite will be launching three new titles between September and Christmas for the Spectrum 48k and CBM 64.

**Enterprise Computers** Stand No 1133  
31-37 Hoxton Street



# PCW SHOW 1984

London N1 6NJ

At last the Enterprise has landed and can be seen on the Enterprise stand. This 64k machine is supported with a range of Enterprise-branded peripherals and software, including a new version of Lisp. There's also a competition where you can win an Enterprise system valued at approximately £1000. Full details available at the Show, where working models of the machine will be on public display for the first time.

**Hayden Book Company** Stand No 813  
1 Gower Street  
London WC1E 6HA

The stand shows books published in the last 12 months with strong emphasis on the IBM PC, PC Junior, Apple machines and the CBM 64. Also included is a selection of book/software packages for Apple computers and a series of reference guides.

**Granada Computer Books** Stand No 1230  
8 Grafton Street  
London W1X 3LA

Granada's list of personal computing books caters for a variety of machines from the Spectrum to the Amstrad, and for different users, from the most basic to the most advanced.

**Hill MacGibbon** Stand No 910  
St Bartholomew House  
92 Fleet Street  
London EC4

Hill MacGibbon launches its range of 'Games to Stretch the Mind'. The first four programs, Ballooning, Special Agent, Car Journey and Punctuation Pete, have been selected by the Book Marketing Council as programs 'which will make an outstanding contribution to home computer users' practical enjoyment of their machines.'

**Hudson Soft** Stand No 1209  
4-7-5 Kojimachi  
Chiyoda  
Tokyo 102  
Japan

Hudson is one of the top software developers in Japan, like Hubasic (Basic), Hucal (spreadsheet) and many games.

**Incentive Software** Stand No 1428  
54 London Street  
Reading GR1 4SQ

Incentive is showing the final part of the Ket trilogy, the Final Mission along with Backtrack, an animated 3D graphics adventure.

**Interceptor Micros** Stand No 907  
Lindon House  
The Screen  
Tadley  
Hants

Interceptor Micros is introducing Trolie Wallie, an arcade game with excellent graphics and music. Also to be released is a new utility, Super Basic. For the Spectrum new releases include an adventure game, At World's End, plus Tiler, an arcade game. Other releases are on view, plus special bargain packs on sale at the stand.

**Interface Publications** Stand No 1009  
9-11 Kensington High Street  
London W8 5NP

As well as its existing list, Interface has new titles appearing for the first time including Tim Hartnell's QL Games Compendium.

**ICL** Stand No 503  
ICL House  
Putney  
London SW15 1SW

ICL is featuring its 16-bit personal computer. The system uses multi-user, Concurrent CP/M-86, which allows up to four users each to run up to three applications simultaneously. Selected ICL distributors are exhibiting a range of applications software.

**IO Research** Stand No 647  
117-121 High Street  
Barnet  
Herts EN5 5UZ

IO Research is announcing Pluto II, the powerful new integrated single card, raster graphics system. Pluto II is compatible with hardware and software for the original Pluto board, and will be available for a range of microcomputers.

**Kaypro (UK)** Stand No 803  
Elm House  
19 Elmshott Lane,  
Cippenham  
Berkshire SL1 5QS

Kaypro is showing its range of portable microcomputers. The Kaypro 2 at £1095 + VAT was voted Portable Computer of the Year 1983; the Kaypro 4 at £1595 + VAT has twice the storage capacity and dBase software included; the Kaypro 10 offers 10 Mbyte hard disk drive and high resolution graphics capability for £2295 + VAT.

**Kempston Micro Electronics** Stand No 1143  
Unit 30, Singer Way  
Woburn Road Industrial Estate  
Kempston  
Bedford MK42 7AF

Kempston's latest addition to its range of Sinclair Spectrum peripherals, the Pro-joystick interface, is set to follow in the path of the earlier Kempston joystick interface. Priced at £19.95 it includes a cartridge slot for ROM-based software and three nine-way D sockets.

Kempston is also displaying its full range of joysticks, including a model for the BBC Micro, and offering special '84 Show prices.

**KGB Micros** Stand No 722  
106 St Leonards Road  
Windsor  
Berks SL4 3DD

New at the Show, KGB has AutoCAD (Computer Aided Drawing) and Microsoft's Word (word processing) running off an Icon networking system. Icon's electronic mail facilities and fast data transfer rate make it suitable for users with multiple IBM PC's.

**Kiltale** Stand No 1409  
131 Liddington Estate  
Old Station Drive  
Leckhampton  
Cheltenham  
Gloucester GL53 0DL

Facilities are available from Kiltale for duplication of up to 200,000 cassettes and 6000 diskettes per week. 5¼in and 3in diskettes can currently be accommodated. A printing and packaging service is also available.

**K-tel International (UK)** Stand No 1331  
620 Western Avenue  
London  
W3 0TU

Front Runner (K-Soft Distribution) is showing a game to stretch your brain and beat your reflexes — Storm Warrior, an all-machine code Commodore 64 graphics adventure. Also from Front Runner is Space Professor, an educational, arcade-style game for the Spectrum 48k.

**LBC News Radio** Stand No 418  
London Broadcasting Co Ltd  
Gough Square  
London EC4P 4LP

LBC is London's news and information radio station broadcasting 24 hours a day, seven days a week. Each day on the PCW stand a number of LBC's presenters will be meeting visitors and reporting from the Show. Clive Bull's Computer Club programme will be broadcasting live from the Show on Sunday.

**Level9 Computing** Stand No 1030  
229 Hughenden Road  
High Wycombe  
Bucks HP13 5PG

Experience Level 9's graphic adven-



# PCW SHOW 1984

tures, plus its acclaimed games for most popular micros.

**Llamasoft** Stand No 1303  
49 Mount Pleasant  
Tadley  
Hants RG26 6BN

Llamasoft has two new releases at the Show. Come and find out what Jeff Minter's latest Commodore 64 design is, why it took so long to create, and which hairy beast stars in it.

**Longman Software** Stand No 1006  
Longman House  
Burnt Mill  
Harlow  
Essex

On show is a range of educational software for early learning and exam revision, along with titles such as Word Games and a slimming program. In addition Longman is offering a range of computer books.

**Lothlorien** Stand No 1424  
56a Park Lane  
Poynton  
Cheshire SK12 1RE

Fancy winning a holiday for two? Why not enter the Lothlorien Special Operations competition. There are three first and three second prizes for Spectrum, Commodore 64 and Atmos owners. And launched at the Show, Lothlorien's £2.99 range of games known as T-riffic, and including Masters of Serbal, New Warmaster and Redcoats.

**Lotus Development UK** Stand No 633  
Consort House  
Victoria Street  
Windsor  
Berks SL4 1EX

Symphony is in action in public for the first time at the Show along with 1-2-3, running for the first time on the ACT Apricot. A team of Lotus experts are running full product demonstrations and hands-on sessions, ready to discuss any technical or training queries on either product.

**Mannesmann Tally** Stand No 708  
Molly Millars Lane  
Wokingham  
RC11 2QT

Mannesmann Tally is showing its printers and plotters tailored for the home computer and small business market. The £249 MT80 is an 80cps 80-column machine with both friction and tractor ideally suited for home computer user.

**Martech** Stand No 113  
Martech House

Bay Terrace  
Pevensey Bay  
East Sussex

See the Official Eddie Kidd Jump Challenge, based on a new game for the 48k Spectrum, Commodore 64, BBC B and Acorn Electron. One of the motor-bikes which world record holder, Eddie, uses will also be on display, and Eddie will be putting in several appearances to talk to visitors.

**Mayking Data** Stand No 817  
57 Portobello Road  
London W11 3DB

Mayking Data offers tape duplication and related services. Engineers produce computer-generated master tapes ready for duplication; masters are kept secure and piracy protection techniques are available. The company's services also include artwork, printing inlays, labels, manufacturing booklets, slip covers and wallets.

**MBS Microtex** Stand No 447  
Raychem House  
Tangier Lane  
Eton  
Windsor  
Berks SL4 6BD

MBS Microtex is the exclusive UK distributor for a new 16-bit single station microcomputer, the MAD-1. Based on the Intel 80186 processor, its features include compatibility with the IBM PC and a choice of MS-DOS Version 2 or Concurrent CPM-86 operating systems.

**Melbourne House** Stand No 1109  
Castle Yard House  
Castle Yard  
Richmond TW10 6TF

Melbourne House is exhibiting its range of books and software for all the popular home computers, including the Spectrum and Commodore machines. The highlight of the stand is expected to be the showing of Sherlock Holmes, Melbourne House's most complex pieces of software since the Hobbit.

**Memotech** Stand No 1325  
Station Lane  
Witney  
Oxon OX8 6BX

Memotech began by manufacturing peripherals for the ZX81. With the gradual decline of the ZX81, Memotech devoted its time to the development of the MTX computers now available at a starting price of £199 for the 48k MTX500. Products under development include the HRX high resolution graphics system for picture and image

processing on the IBM PC.

**Microdeal** Stand No 1316  
41 Truro Road  
St Austell  
Cornwall PL25 5JE

Microdeal is showing its future release Cuthbert in the Tombs for the Commodore 64. Also on show is a range of other software and utilities for the Commodore 64, Atari and Dragon computers..

**MicroPower** Stand No 122  
Northwood House  
North Street  
Leeds LS7 2AA

Micro Power is giving the first public showing of its Christmas releases at the Show. These include titles for the Commodore 64, Electron, Amstrad and BBC Micro.

**Microvitec** Stand No 1043  
Futures Way  
Bolling Road  
Bradford BD4 7TU

The new QL-compatible colour monitor heads the full display of Cub RGB monitors from Microvitec. New for the Show — Tecmar colour graphics cards — 980 pixels per line in a package which includes a high resolution, long persistence tube.

**Mikro-Gen** Stand No 928  
44 The Broadway  
Bracknell  
Berks RG12 1AG

Wally Week's new mate stars in Py-jamarama and is shortly to be making his debut. Other new programs are Witches' Cauldron and Air Traffic Control.

**Microvoice Corporation** Stand No 413  
Tetsuo Narita  
Shinei Building  
8-5 Nishishinjuku 3-chrome  
Shinjuku-ku  
Tokyo  
160 Japan

Microvoice Corporation is introducing two portable computers — the Mugen and Formula-1. The Mugen is IBM PC compatible, Formula-1 is an all-in-one portable computer with a built-in EPROM programmer and thermal printer.

**Miniature Tool Company** Stand No 1305  
27 Queensbury Station Parade  
Edgware  
Middlesex

On display are a range of plugs, sockets, connectors and cables suitable for most



# PCW SHOW 1984

home computers. The company also distributes Memorex floppy disks which are being offered at special exhibition prices.

**Mirrorsoft** Stand Nos 1047 & 1330  
Mirror Group Newspapers Ltd  
Holborn Circus  
London EC1P 1DQ

Mirrorsoft is the software division of Mirror Group Newspapers, publishers of the *Daily Mirror*, *Sunday Mirror* and *Sunday People*. It is currently producing programs covering four categories.

**Molimerx** Stand No 117  
1 Buckhurst Road  
Bexhill-on-Sea  
East Sussex TN40 1QF

Molimerx supplies software for a large number of machines, and has recently branched out into supporting the Sanyo 550 series. It is exhibiting its latest software for that machine, including a new graphics package.

**NCC** Stand No 414  
11 New Fetter Lane  
London EC1

The NCC is offering a businessman's advisory service.

**New Generation Software** Stand No 1025  
The Brooklands  
Sunnybank  
Lyncombe Vale  
Bath BA2 4NA

The sequel to Trashman, Travel with Trashman, is being previewed at the Show, with Cliffhanger, a new game for the Commodore 64.

**Ocean Software** Stand Nos 1324 & 1328  
Ocean House  
6 Central Street  
Manchester M2 5NS

A range of games software gets its first showing at the PCW Show. Tie-ins with TV characters and follow-ups to Kong and Hunchback lead the new range, with adaptations of top-selling US games for British computers.

**OELimited** Stand No 644  
North Point  
Gilwilly Industrial Estate  
Penrith  
Cumbria CA11 9BN

OEL designs and manufactures micro-computer communications hardware with software support. Featured at the Show are the Commodore 64 Teletext Adaptor, the Telemod series of modems and, for the Spectrum, the VTX 5000 modem and the TTX 2000 Teletext

adaptor.

Prestel/Micronet, electronic mail and other home computer applications are being demonstrated.

**Opus Supplies** Stand No 1001  
158 Camberwell Road  
London SE5 0EE

Opus has a full range of disk drives available at the Show, all backed by a two year warranty, and disk interfaces are on sale for the Spectrum and BBC Micro. The JVC high resolution colour monitor is also available for use with the QL and BBC.

**Oric** Stand No 1317  
Cowarm Park  
London Road  
Ascot  
Berks

Oric is demonstrating its entire product range including the Atmos micro-computer, 3in Oric disk drive, MCP40 four-colour printer/plotter, a selection of the latest Oric software plus two new additions to the range — the Oric V23 communications modem and 80-column dot matrix printer.

**Ozwise Computers** Stand No 704  
236 Imperial Drive  
Rayners Lane  
Harrow  
Middlesex HA2 7HJ

From its range of Apple, Apricot, IBM, Epson, Sanyo and BBC products, Ozwise is displaying the latest and most innovative.

**PC Engineering and Maintenance** Stand No 630  
Lansbury Estate  
102 Lower Guildford Road  
Knaphill  
Woking GU21 2EP

PC Engineering and Maintenance specialises in nationwide maintenance and repair of all the popular business micros and peripheral equipment. Repairs are carried out on site.

**Personal Computer World** Stand No 108  
VNU Business Publications  
Evelyn House  
62 Oxford Street  
London W1

The Leading Edge feature on our stand provides a prelude to a tour of the Show, as it gives a chance to look at our selection of the most advanced products and best hardware and software available.

On sale is PCW's October issue — a special Show issue with the Show Catalogue bandwrapped to it — and a

selection of back issues.

Subscribe to PCW at the Show and we will refund your entrance price, so you visit the Show free of charge and receive a copy of PCW delivered direct to you every month!

**Phoenix Software** Stand No 314  
Spangles House  
116 Marsh Road  
Pinner, Middlesex

Phoenix presents its combined arcade/adventure tapes. You fight your way through the arcade game to gain entry to the adventure, but if you don't make it, open the panic packet for an admission ticket to the adventure.

**Power Testing** Stand No 530  
23 Tallon Road  
Hutton  
Brentwood CM13 1TE

To protect your computer system and data from loss of power, and to prevent spikes and surges from reaching your hardware, consider the Power Bank. It connects between the mains and your machine, and is constantly maintained at a stabilised frequency and sine wave voltage regardless of the mains input.

**Practicorp** Stand No 739  
Goddard Road  
Whitehouse Industrial Estate  
Ipswich  
Suffolk IP1 5NP

Practicorp's new low integrated software range of database, word processor and spreadsheet for the IBM PC gets its first public outing at the Show. Also on display is PractiCalc II.

**Prentice-Hall International** Stand No 400  
66 Wood Lane End  
Hemel Hempstead  
Herts HP2 4RG

Prentice-Hall International is the UK division of the US publishing company Prentice-Hall Inc of New Jersey. Many computing titles are published each year by Prentice-Hall and its associated imprints.

**Protek Computing** Stand No 1306  
1a Young Square  
Brucefield Industrial Park  
Livingston EH54 9BX

The new Protek 1200 modem is now available at £59.95 retail. The 1200 modem is compatible with any RS232C/RS423 computer interface. Interface packs, including cables, controlling software and serial interface (if required) are available for the BBC Model B, 48k Spectrum, Commodore 64 plus most popular micros.



# PCW SHOW 1984

**Psion** Stand No 432  
22 Dorset Square  
London NW1

Xchange is both a modular and integrated suite of business applications programs, covering word processing, database management, financial planning and business graphics. The stand also features the Psion Organiser pocket computer.

**Quest International Computers** Stand No 425  
Quest PLC Group  
Chandlers Ford  
Hants

In addition to CP/M-86 for the Sinclair QL, Quest is showing its Firefly hard disk running on the BBC Micro for the first time. Quest also has the Firefly with optional tape streamer running under CP/M and MS-DOS on the IBM PC, DEC Rainbow, Sirius and Apricot. Details of a low cost network and a tape streamer developed for the IBM PC are also available on the stand. Disk and memory products for the QL are shortly to be announced.

**Quicksilver** Stand Nos 1413 & 1512  
Palmerston Park House  
13 Palmerston Road  
Southampton  
Hampshire SO1 1LL

Out in the loneliness of interstellar space a man needs something to do: the endless dust clouds, the occasional comet, the friendly sight of Captain Quicksilver picking at rocks. 'Yeah, sure is hard out here. Why, without my Game Lords club magazine to keep me company I'd have gone crazy years ago. And so would my friend, the garbage shoot, wouldn't you, Garb?'

**Romantic Robot** Stand No 1405  
113 Melrose Avenue  
London NW2 4LX

Romantic Robot offers a set of four machine code utilities called Trans-Express. Visitors to the PCW Show can buy a new upgraded version on cassette or microdrive cartridge. Trans-Express is a package for transferring and maintaining Spectrum programs/files.

Romantic Robot is also selling a music utility for the ZX Spectrum called The Music Typewriter and a program for the Amstrad CPC464.

**Seescan** Stand No 326  
25 Gwydir Street  
Cambridge CB1 2LG

Seescan designs, manufactures and consults on image processing systems. On display, high resolution stand-alone

systems, the MkII digital camera and book, *Image processing for the BBC Micro* is launched at the Show, as are advanced user guides for the Electron, Oric, QL, BBC and Spectrum micros.

**Shinecrest Products** Stand No 228  
Unit 14  
Dicker Mill  
Hertford  
SG13 7AE

Shinecrest is showing its new range of computer furniture for home and small business users.

**Shiva Publishing** Stand No 1024  
64 Welsh Row  
Nantwich  
Cheshire CW5 5RQ

The *Gateway to Computing* series of books for younger readers is featured on the Shiva stand. There are versions for the Commodore 64, BBC Micro, Spectrum and Dragon. Also, Shiva's number and logic educational software for 5-8 year olds is on display.

**Silicon Valley** Stand No 412  
164 Grays Inn Road  
London WC1

An authorised dealer for IBM, Compaq, ACT and Apple micros offering advice and support.

**Sinclair Research** Stand Nos 222 & 323  
25 Willis Road  
Cambridge CB1 2AQ

First time on-stand selling of the Sinclair QL professional computer for £399 inc VAT is the central feature of Sinclair Research's stands.

**Softek International** Stand No 1012  
12/13 Henrietta Street  
Covent Garden  
London WC2E 8LH

Come to The Edge to discover this unique game along with the first ever Mega-Games. See the Softek Biltzware too, and, of course, MSX software.

**Softsel** Stand No 544  
Central Way  
North Feltham Trading Estate  
Feltham  
Middlesex

Softsel is promoting its product range and dealer services at the PCW Show. The company distributes business, recreation and education packages which run on Apple, Atari, DEC, IBM, Commodore, BBC and other leading makes of microcomputers.

**Software Index** Stand No 1142  
IPC Magazine Ltd

Westover House  
West Quay Road  
Poole  
Dorset BH15 1JG

Software Index is a listing of software available for the popular home micros. It includes information on prices, program operation, sound, memory required, colour, names and addresses of retailers and screen photographs.

**Sportscene Specialist Press** Stand No 1032  
14 Rathbone Place  
London W1P 1DE

Sportscene's stable includes *Microscope*, *Your Spectrum*, *Your '64* and *QL User*. The same group took PCW to its number one slot prior to selling it to present owners VNU, and is responsible for packaging the biggest selling computer publication in the world — *The Home Computer Course*.

On the stand end users can buy back numbers of all these papers, and more.

**Stell Software** Stand No 1209  
36 Limefield Avenue  
Whalley  
Lancs BB6 9RJ

Stell displays its range of educational games for children. Titles are available to suit ages from two to 15-years-old and will run on most home computers.

**Sunshine** Stand No 1031  
12-13 Little Newport Street  
London WC2R 3LD

Sunshine is showing its four magazines — *Popular Computing Weekly*, *Dragon User*, *Micro Adventurer* and *Commodore Horizons*. It is also exhibiting its range of 50 books. New titles being launched at the Show include the first books for the new Commodore machines — the Plus /4 and the C16.

**Sybex** Stand No 416  
Unit 4,  
Bourne Industrial Park  
Bourne Road  
Crayford, Kent

Sybex titles include *Programming the Z80*, *Your First Basic* and *Micro Interfacing Techniques*. Sybex now announces the opening of its new UK branch office at Crayford, selling a full range of US titles direct to the trade from stock, as well as new ones aimed at UK micros.

**Tandy Corporation** Stand No 102  
Tameway Tower  
Bridge Street  
Walsall  
West Midlands WS1 1LA



# PCW SHOW 1984

In addition to launching new products, Tandy is showing its range of established machines.

**Tansoft** Stand No 1322  
Units 1 and 2  
Techno Park  
Newmarket Road  
Cambridge CB5 8PB

Tansoft's appearance at the PCW Show coincides with the release of a number of high quality titles for the Oric 1/Atmos. Tansoft also announces its entry into the Commodore market with at least two new arcade games.

*Oric Owner* will be represented as will the Oric Club.

**Tatung (UK)** Stand Nos 1245, 1244 & 1135  
Bridgnorth  
Shropshire WV15 6BQ

Tatung (UK) marks its entry as a contender in the computer market with the exhibition of the Einstein colour microcomputer designed for the home, business and education markets; the PC 2000 small business computer; and a range of terminals offering standard emulations. In addition there will be a complementary range of printers, monitors and disk drives together with a range of software.

**Thame Systems** Stand No 431  
Thame Park Road  
Thame,  
Oxon OX9 3XD

Thame is displaying its range of printers from Brother, NEC and Toshiba, and is introducing the new Mitsui Epson enhanced compatibles. This is your opportunity to evaluate the latest low-cost daisy and matrix ranges, as well as check out the advantages of the Toshiba dual-mode machines.

**Time Computer Products** Stand Nos 603 & 406  
17 Liverpool Street  
London EC2M 7PD

Stand No 603 has on sale 3M and Dyan Diskettes, cleaning products and the Box Clever library cases.

Stand No 406 is promoting the new diskettes, called Nashua Spinning Discs, available to both trade and retail customers.

**Top Twenty Games sponsored by Websters** Stand No 944

Try out the latest and most popular games in an arcade, purpose-built for the Show. The Top Twenty games are presented, one game per machine, with details of machine compatibility, price, and, of course, chart position.

**Touchmaster** Stand No 1017  
PO Box 3  
Port Talbot  
West Glamorgan SA13 1WH

Touchmaster is an A4, touch-sensitive surface which allows a range of users to effectively bypass the keyboard. To operate Touchmaster, you slide an overlay onto its surface, load the matching software into your computer, touch the overlay with one finger—and your computer is at your command. Already available for the Commodore 64, BBC B, Spectrum, VIC-20, and Dragon 64, Touchmaster comes complete with relevant computer interface, instruction manual and a graphics software package.

**Transam Microsystems** Stand No 500  
59/61 Theobalds Road  
London WC1X 8SF

Transam is showing the new Trans-link low cost network system which allows networking of Wren, Epson QX-10, S100 systems and others. Transam is an authorised dealer for IBM, Epson, Wren, ACT, Sharp and NEC micros.

**US Gold** Stand No 1301  
Unit 24  
Tipton Trading Estate  
Bloomfield Road  
Tipton  
West Midlands DY4 9AH

US Gold aims to license the best US software and bring it to the UK market at UK prices.

This autumn sees the release of more US Gold titles including Zaxxon for the Commodore 64. Selected titles will also be available for the Spectrum with the first release being Beach-head. A catalogue of the full range is available.

**Virgin Games** Stand No 1332  
2-4 Vernon Yard  
London W11

Virgin Games is showing the results of its re-structuring and programming team formation earlier this year. These include: for the Commodore 64 the sequel to Falcon Patrol; from Hungary a thinking man's arcade game, Terrorist; and a graphic arcade adventure, Sorcery. Also being shown is Strange Loop, a 240-room arcade adventure for the Spectrum 48k.

**Visions Software Factory** Stand No 1002  
1 Felgate Mews  
Studland Street  
London W6 9JT

Visions is showing a range of home, educational and utilities software. Its software is currently available for the

Spectrum, BBC, Electron, VIC-20, Commodore 64, Atari, Apple, QL. Packages include educational software in English and many other languages including Arabic, a new and powerful database, a program generator, QL products, a school management system and a Spectrum networking system.

**VNU Business Publications** Stand No Not known  
62 Oxford Street  
London W1

VNU Business Publications brings you a range of microcomputer titles, including:

*Micro Decision* — a microcomputer magazine for businessmen; written in non-technical, jargon-free language with applications directly related to readers' businesses.

*What Micro?* — a buyer's guide to microcomputer hardware and software; each month there are news, views, comparative reviews, Bench-tests and user panels with editorial geared to the home, business and education buyer.

*Sinclair Answers* — a new quarterly aimed at the whole Sinclair market. All aspects of the spectrum from games to business, QL and ZX81, are covered. Also out soon is *BBC Computer Answers*, aimed at VIC and Commodore 64 owners; and

*Personal Computer Games* — a buyer's guide for games software.

**John Wiley & Sons** Stand No 601  
Baffins Lane  
Chichester  
West Sussex PO19 1UD

Wiley publishes and distributes books and software to help users in business, at school, in industry and at home. Around 1000 titles are available from 13 publishers and software houses. You'll find the entire range from TABS, Acornsoft, National Computing Centre, Ellis Horwood, Mosaic Bookware, Sigma Press, Bourne Educational Software, ASK, Ebury Software, Ivanberg, Sinclair Computerguides, Microbooks, and Wiley's own comprehensive range.





## Binomial coefficients

The Binomial Coefficients, variously denoted by  $n^C r$  or  $\binom{n}{r}$  are defined by  $\binom{n}{r} = \frac{n!}{r!(n-r)!}$  where integers  $n$  and  $r$  satisfy  $0 \leq r \leq n$ ; and  $r! = 1.2.3 \dots r, r > 0$ ;  $0! = 1$ . For example,  $\binom{20}{10} = 184756$ .

These coefficients, whose common occurrences include the algebraic result  $(A+B)^n = \sum_{r=0}^n \binom{n}{r} A^r B^{n-r}$  together with The Bernoulli Distribution in applied statistics are directly available (for sufficiently small  $n$  and  $r$ ) on many scientific calculators.

However, since  $\binom{n+1}{r} = \binom{n}{r-1} + \binom{n}{r}$  the Binomial Coefficients may be written down using Pascal's Triangle. Thus:

|     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| n=1 |  | 1 | 1 |   |   |   |
| n=2 |  | 1 | 2 | 1 |   |   |
| n=3 |  | 1 | 3 | 3 | 1 |   |
| n=4 |  | 1 | 4 | 6 | 4 | 1 |

The array is edged with ones, while each interior term is the sum of the two terms immediately above it;  $r$  is counted along the diagonals of the array.

Let's turn our attention to certain results concerning the number theoretic properties of the  $\binom{n}{r}$  as distinct from their usage in other branches of mathematics.

- (1) If the binomial coefficients are factorised thus:  $\binom{n}{k} = UV$  where every factor of  $U$  is less than or equal to  $k$  while every factor of  $V$  is greater than  $k$  there are known to be finitely many coefficients with  $n \geq 2k$  for which  $U > V$ . Determine such cases for  $k = 3, 5, 7, \dots$ . *Note.* If  $k=3$  then  $n = 8, 9, 10, 18, 82$  and 162 while for  $k=5$ ,  $n = 10, 12$ , and 28 are known to be the only cases for  $n \leq 551$ .  
(2) If  $n$  is a prime number greater than 3, the Wolstenholmes' Theorem states

by Mike Mudge

that  $\binom{2n-1}{n}$  is congruent to 1 modulo  $n^3$ :

that is  $\binom{2n-1}{n} = An^3 + 1$ , where  $A$  is an integer. Display empirical evidence for this theorem and consider the possible truth of its converse.

(3) What can be said about the largest divisor of  $\binom{n}{k}$  which is less than  $n$ ?

If  $n \geq k^2 - 1$  there is a prime divisor less than or equal to  $n/k$  apart from  $\binom{62}{6} = 61474519$ .

If  $n < k(k+3)$  there is a prime divisor less than or equal to  $k+1$  apart from the cases  $\binom{7}{3}, \binom{14}{9}, \binom{23}{5}, \binom{44}{8}$ , and  $\binom{47}{11}$ .

How do we best generate such divisors?

(4) When is  $\binom{2n}{n} \equiv 1 \pmod{105}$ ? That is, when do  $\binom{2n}{n}$  and 105 have no

common factor. RL Graham offered a prize of \$100 for proving that this happened infinitely often. At least fourteen values of  $n$  are known  $n = 1, 10, 756, \dots$

If  $g(n)$  is the smallest prime factor of  $\binom{2n}{n}$ ,

then  $g(3160) = 13$  and  $g(n) \leq 11$  for  $3160 < n < 10^{110}$ . Does this help?

Readers are invited to investigate the above problems and results with an objective of extending empirical evidence and possibly generating new conjectures.

Submissions should include program listings, hardware description, run times and output. These will be judged for accuracy, originality and efficiency (not necessarily in that order) and a prize of £10 will be awarded to the 'best' entry received by 1 January 1985.

Please address submissions to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs.

## Review—Repunits—April 1984

Repunits have found favour far and wide: a most elegant work, conjecturing the primality of  $aR_k + b$  when

| a | b  | k     |
|---|----|-------|
| 3 | -2 | 50860 |
| 5 | -2 | 66    |
| 7 | 2  | 66    |

and establishing the primality of  $6R_{66} + 1$  in less than three hours in Forth on a Jupiter Ace arrived from Denmark.

A Sharp PC3201 using Z80 machine code on The Isle of Mull suggests that a prime  $p$  greater than 3 will be a factor of  $R_{n(p-1)}$  for  $n=2, 3, \dots$

Substantial references on the subject of repunits are to be found in the paperback *Repunits and Repetends* by Samuel Yates published by The Star Publishing Company, Boynton Beach Florida 1982.

This month's winner is Robin Merson of 2 Vine Close, Wrecclesham, Farnham, Surrey, GU10 4TE. Robin appeals to any reader who has implemented the Primality Testing Algorithm described by H Cohen & HW Lenstra (*Mathematics of Computation*, vol.42, Jan 1984) to contact him on Frensham 3587 for an 'info' exchange with Hardy and Wright-type algorithms.

A summary of Robin's results follows. Further details are available from him or myself.

Using an Apple microcomputer several primes have been found of the form  $d(n)e$ , where  $d=5, 6, 7$  or 8 and  $e$  has one or two digits. An embedded  $(n)$  in a number implies the previous digit is repeated  $n$  times. For example,  $10(4)2$  stands for 100002. The largest for each of the values of  $d$  are  $5(92)21$ ,  $6(120)1$ ,  $7(99)1$  and  $8(138)1$ .

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided. **END**

## LEISURE LINES

by J J Clessa

### Quickie

Here is a remark attributed to that famous geometrician, PI Thagorus: 'Now I have a rough predictor of circle areas and volume.'

### Prize Puzzle

And now one for the micros.

In the annual festival games held at the village of Little Dingbat in West Sussex, the main event is the marathon.

This year, all the entrants were numbered sequentially (1, 2, 3, ...).

By coincidence, all those who completed the race carried numbers which

were either exact primes or exact powers of other numbers. Furthermore, the total of the race numbers of the finishers was exactly equal to the total of the race numbers of those who dropped out.

How many entrants were in the race?

Answers, on postcards only, to Leisure Lines, PCW Prize Puzzle, October 1984, 62 Oxford Street, London W1, to arrive not later than 31 October 1984.

### July Prize Puzzle

The problem was quite easily cracked

by micro and several people sent in their programs and printouts.

The winning entry came from Adam Jefferson of Bradford, Yorks. Congratulations, Adam, your prize is on its way.

The solution to the problem was that the Dawsons and the Firths were the RC families—the children of these families were given £31.25 each.

Keep puzzling.







- # TRANSACTION FILE ADVERTISEMENT FORM

|                                                      |                                                                  |                    |                                  |                                 |
|------------------------------------------------------|------------------------------------------------------------------|--------------------|----------------------------------|---------------------------------|
| What is the purpose of this document?                | To provide information about the project and its progress.       | Project Overview   | Project Name: [Project Name]     | Project ID: [Project ID]        |
| What is the scope of the project?                    | The project aims to develop a new software application.          | Project Scope      | Project Start Date: [Start Date] | Project End Date: [End Date]    |
| What are the key objectives of the project?          | The key objectives are to improve efficiency and reduce costs.   | Project Objectives | Project Manager: [Manager Name]  | Project Sponsor: [Sponsor Name] |
| What are the main risks associated with the project? | The main risks are budget overruns and delays.                   | Project Risks      | Project Status: [Status]         | Project Health: [Health]        |
| What are the next steps in the project?              | The next steps are to complete the design and start development. | Project Next Steps | Project Contact: [Contact Name]  | Project Email: [Email Address]  |



## *You can't afford to miss out on inexpensive equipment insurance for your computer club. Rupert Steele is the man with the details.*

One of the ACC's major activities is the Prestel database. Normally, it is extremely expensive to be an information provider on Prestel, but computer club members can become ClubSpot editors for virtually nothing. If you are interested in becoming a ClubSpot editor, the ACC is holding a training conference on Saturday 20 October at the British Telecom Technical College, Yarnfield, Stone, Staffordshire. For further information, contact Andy Leeder, Church Farm, Stratton St Michael, Norwich NR15 2QB (Systel: 050830355).

It is intended also to hold an editors' training conference at County Hall, London, some time during the next few months. At both conferences, delegates will be asked to make a small contribution towards the cost of running the conference and printing the manual: £10 for individuals, £5 for those attending on behalf of a club, and £2.50 for the first editor of an affiliated club.

### **Computer insurance**

Equipment insurance is now available from the ACC in addition to the free public liability insurance announced earlier this year to the tune of £500,000 per incident. Unfortunately, the equipment insurance is not free, but it is very cheap.

The scheme covers equipment belonging to a club, or members' equip-

ment at club meetings and is available to ACC clubs in 'units' of £2000 worth of cover for £4 per annum. The policy is underwritten by British Engine and insures against material damage to systems involving microchip technology, which consists of microprocessors with associated peripherals (such as disk drives, printers, modems, visual displays) and media (tapes and disks).

#### **What does the policy cover?**

Material damage — loss of or damage to all or part of the covered equipment, including tapes and disks, from any accidental cause such as fire, theft, impact, and so on, both on the 'premises' and in transit between locations.

#### **What does the policy exclude?**

- ★ The first £25 of any claim.
- ★ Normal wear and tear, electrical or mechanical breakdown, gradual deterioration, rust, and so on.
- ★ War risks, riot, strike, civil commotion, nuclear risks, sonic boom.
- ★ Theft from unlocked vehicles.

#### **How many units of cover required?**

You must take out at least two units at £4pa each if you choose to participate. This gives cover of £4000 total, which should represent the total new replacement value of all the computer equipment likely to be on the premises at any one time. If that is insufficient, you should add another unit for each £2000 (or part thereof) worth of equipment that you wish to cover. Remember that you should count equipment owned by

the club plus the value of members' equipment likely to be at a meeting — you should not include (and the policy does not cover) members' equipment at individual homes. If you attend exhibitions with significant amounts of club and members' equipment on your stand, make sure that you have enough units to cover them as well as meetings.

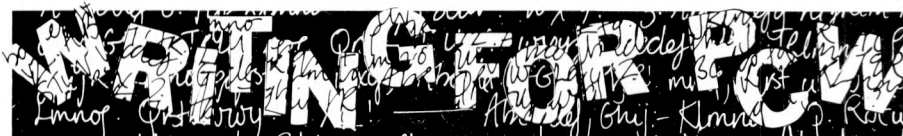
#### **Definitions**

(1) The premises — the address at which the club is holding an officially organised meeting, the club's part of any exhibition or function in which the club is participating or for equipment belonging to the club.

(2) The insured property consists of mini- and microcomputers including peripherals and media-owned, leased or hired by the insured and for which he is responsible. The insured is defined as the ACC, those affiliated clubs who have taken out units of cover and their individual members.

The ACC will make reasonable efforts to notify participating clubs in writing if the policy is discontinued either by the ACC or the Underwriters. The ACC is neither empowered nor able to accept responsibility for meeting any claims that may arise; the position of the Association being that of coordinator not insurer.

If you want to know about the ACC, contact me: Rupert Steele, 17 Lawrie Park Crescent, London, SE266HH ortel: (01) 370 0601.



PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing.

If your article is already written, send it in — taking care to ensure that your name and address, together with a daytime phone number if possible, appears on both the covering letter and the manuscript. Manuscripts should, preferably, be typed or printed out (dot matrix output is quite acceptable) but *must* be double line-spaced with ample margins top and bottom and on each side. Make sure you keep a copy of *everything* you send us.

We accept articles on ACT Sirius 1 (CP/M-86 or MS-DOS) single-sided. In

an emergency we can accept stuff over the phone by modem using BSTAM at 300 baud but as we can only do this during office hours (10am to 6pm) it's not exactly a cheap way of getting your article to us! We can also accept material by Telecom Gold. Please note that if you want to send your article in this way, it should be as an ASCII file rather than as a 'work file' for any one type of word processor — that is, use your word processor to print the text to disk instead of to paper.

Please note that we cannot undertake to return manuscripts, diagrams and photographs, although we always try to return the latter. We can only return disks if they are accompanied by adequate postage and packaging.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one- or two-page synopsis giving the proposed structure, sequence and content is what we're looking

for. But before you send anything to us, take a good look through PCW to see what sort of articles get published and to see what style or writing we prefer (basically, avoiding pomposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other.

Please be sure to tell us if you've sent the article to another magazine — it would be very awkward indeed if the same article were to appear simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work but please be patient! Payment *normally* follows about 4-6 weeks after publication. **END**



# BENCHMARKS

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR L=1 TO 5
180 NEXT L
190 IF K<1000 THEN 140
```

```
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

# DIARY DATA

*Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, etc.*

|             |                                                                                                                              |            |
|-------------|------------------------------------------------------------------------------------------------------------------------------|------------|
| London      | (Olympia 2), Personal Computer World Show. Contact: Montbuild, (01) 486 1951                                                 | 19-23 Sept |
| Brighton    | (Brighton Centre), Computers In Communication & Control Exbn. Contact: Institute of Electrical Engineers, (01) 240 1871      | 26-28 Sept |
| Leeds       | (Exbn Centre), Commodore Computer Show. Contact: Fiona Anderson, (01) 388 1675                                               | 27-29 Sept |
| Spenny Moor | Computer Technology Exbn. Contact: Industry Section, (0388) 816166                                                           | 3-5 Oct    |
| London      | (Royal Garden Hotel), HOTECH — Computers in Hotel Industry. Contact: Reed Exbns, (01) 643 8040                               | 3-4 Oct    |
| Aberdeen    | (Exbn & Conf Centre), Offshore Computer Exbn & Conf. Contact: Offshore Confs & Exbns, (01) 549 5831                          | 8-10 Oct   |
| London      | (Novotel), Int Exbn of Products & Services for the Auto'd Factory. Contact: Industrial & Trade Fairs Int Ltd, (021) 705 6707 | 9-11 Oct   |
| London      | (Wembley Conf Centre), Computer Graphics FX Exbns. Contact: Online (01) 868 4466                                             | 9-11 Oct   |
| Manchester  | (New Century House), Apricot & Sirius Show North. Contact: Dennis Jarrett, (01) 241 2354                                     | 16-18 Oct  |
| Brighton    | (Exbn Hall), INTERNEPCON Exbn. Contact: P Spencer, (0734) 596 161                                                            | 16-18 Oct  |
| Surrey      | (Sandown Exbn Centre), Surrey Business to Business Show. Contact: Marlowe Exbns, (01) 794 3551.                              | 17-18 Oct  |
| Doncaster   | (Exbn Centre), Business & Technology Trade Fair. Contact: R & VG Exbns Ltd, (0273) 203601                                    | 21-24 Oct  |
| London      | (Earls Court), London Business Equipment Show. Contact: Christine Prentice, (01) 674 1001                                    | 23-26 Oct  |
| London      | (Alexandra Palace), Electron & BBC Micro Show. Contact: Susie Williams, (061) 456 8383                                       | 25-28 Oct  |



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PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer. If possible, the printout format should match what appears on the screen. (Commodore 64 owners should use the Brackets program printed in the June issue to make control codes understandable.)

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

All programs should be fully debugged and your own original, unpublished work.

We'll do our best to return any submissions that are sent in with the appropriate postage and packing, but please keep a copy of everything yourself.

Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month. Send your contributions to Nick Walker, PCW Programs, 62 Oxford St, London W1A 2HG.

This month's selection features a host of useful programs for a variety of micros. Commodore 64 owners will appreciate the Program of the Month as it's a database. '64 programmers will also enjoy the powerful Sprite Editor and have fun with the Mouse Master, which brings a Macintosh-style mouse to the '64.

BBC owners writing serious applications will appreciate the screen designer and input validation programs, which will make user-friendly input screens easy to incorporate into programs. Also, there should be quite a following for 'G', a compiler for converting graphics programs into super-fast

machine code.

Finally, there's Battle Stations, and a cribbage game for the Spectrum which features a computer opponent with some nasty human traits.



Games



Scientific/mathematic



Business



Toolkit/utilities



Educational/Computer  
Aided Learning



## Program of the Month Commodore 64 Superfile by John Todd

Superfile is a disk-based database program for '64 owners which will satisfy most users' filing requirements. Using this program, you can create a file consisting of records of up to 30 fields of a maximum of 30 characters each. However, there's a maximum of 255 characters per record.

Once loaded, the program presents you with a menu of options which are:  
1) **Enter data** — this allows the user to add a complete record to an existing file.

2) **Amend data** — this allows the user to change any individual field of any desired record. The record number required can be found using either of the following search options.

3) **Item Search** — any field can be searched for a desired item, or for anything not equal to the selected item.

4) **Record Search** — search for a specified record number.

5) **Close files** — this must be done after all sessions as it allows the program to access data created during the session.



# PROGRAM FILE

```

10 REM*****
20 REM**   RANDOM   FILING PROGRAM   **
30 REM**   BY
40 REM**   JOHN TODD (1984)
50 REM*****
100 CLR:POKE53272,23:POKE53280,11:POKE53281,11:PRINT"[CLS][GR2]"
104 MAX=500
105 DIMIX(3,MAX):DIMSR(MAX)
110 CRS=CHR$(13):X=0:T=1:S=1
120 PRINT"[5CD]":PRINTTAB(15)"[G>D]ISC [G>F]ILE[CD]"
130 PRINTTAB(14)"PLEASE WAIT"
135 PR=49152:IP=PR+26:IFPEEK(PR)=32ANDPEEK(PR+1)=253ANDPEEK(PR+26)=32THEN150
140 GOSUB7000:REM M/C FOR PRINT@+INPUT@
150 GOSUB6100:REM PRINT BLANK MENU PAGE
160 SYSPR,10,2,"[REV] [G>O]PTIONS AVAILABLE [OFF]"
170 SYSPR,7,6,"[REV](1)[OFF][7SPC][G>L]OAD FILE FROM DISC"
180 SYSPR,7,8,"[REV](2)[OFF][7SPC][G>C]REATE NEW FILE"
190 SYSPR,7,10,"[REV](0)[OFF][7SPC][G>Q]UIT"
200 GETK$:IFK$="1"THENGOSUB2500:GOSUB1200:GOTO300
210 IFK$="2"THENGOSUB2000:GOSUB1400:TX=X:X=MAX:GOSUB1000:X=TX:GOTO300
220 IFK$="0"THEN END
230 GOTO200
300 GOSUB6100:SYSPR,10,2,"[REV] [G>O]PTIONS AVAILABLE [OFF]"
310 SYSPR,10,5,"[REV](1)[OFF][7SPC][G>E]NTER DATA"
320 SYSPR,10,7,"[REV](2)[OFF][7SPC][G>A]MEND DATA"
330 SYSPR,10,9,"[REV](3)[OFF][7SPC][G>I]TEM SEARCH"
340 SYSPR,10,11,"[REV](4)[OFF][7SPC][G>R]ECORD# SEARCH"
345 SYSPR,10,13,"[REV](0)[OFF][7SPC][G>C]LOSE FILES"
350 GETK$:IFK$="1"THENGOSUB4000:GOTO300
360 IFK$="2"THENGOSUB4200:GOTO300
370 IFK$="3"THENGOSUB3000:GOTO300
380 IFK$="4"THENGOSUB3600:GOTO300
390 IFK$="0"THENGOSUB 1000:SYSPR,9,20,"RECORDS ON FILE [BLK]";X-1"[GR2]":END
400 IFX=MAX+1THEN5000
500 GOTO350
1000 REM*****
1010 REM*   CREATE SEQUENTIAL FILE   *
1020 REM*****
1040 OPEN4,8,4,"@0:"+"NF$+",S,W"
1050 PRINT#4,X:CR$:F
1055 FORR=1TOF:PRINT#4,FP(R):CR$:FL(R):CR$:NS(R):CR$:NEXTR
1060 FORR=1TO X
1070 PRINT#4,IX(1,R):CR$:IX(2,R):CR$:IX(3,R)
1080 NEXTR:CLOSE4
1090 RETURN
1200 REM*****
1210 REM*   READ SEQUENTIAL FILE   *
1220 REM*****
1230 OPEN4,8,4,"@0:"+"NF$+",S,R"
1240 INPUT#4,X,F
1245 DIM Z$(F),N$(F),FL(F),FP(F)
1250 FORR=1TOF:INPUT#4,FP(R),FL(R),N$(R):NEXTR
1255 FORR=1TOX
1260 INPUT#4,IX(1,R),IX(2,R),IX(3,R)
1270 NEXTR:CLOSE4
1280 RETURN
1400 REM*****
1410 REM*   BLOCK PRINT TO DISC   *
1420 REM*****
1425 GOSUB1900
1430 OPEN15,8,15
1435 OPEN5,8,5,"#"
1437 PRINT#15,"B-P:";5;1
1465 FORY=1TOF:PRINT#5,Z$(Y):CHR$(13)::NEXT
1480 PRINT#15,"U2:";5;0:T;S
1490 IX(1,X)=X:IX(2,X)=T:IX(3,X)=S
1500 X=X+1
1510 CLOSE5:CLOSE15:RETURN
1600 REM*****
1610 REM*   BLOCK READ FROM DISC   *
1620 REM*****
1630 OPEN15,8,15
1635 OPEN5,8,5,"#"
1640 PRINT#15,"U1:";5;0:T;S
1644 PRINT#15,"B-P:";5;1
1645 FORY=1TOF
1650 INPUT#5,Z$(Y):
1655 NEXT
1660 CLOSE5:CLOSE15:RETURN
1900 REM*****
1910 REM*   SET TRACK + SECTOR   *
1920 REM*****
1930 OPEN15,8,15
1940 PRINT#15,"B-A:";0:T;S
1950 INPUT#15,FA,FB$,FC,FD:IFFA=65THENT=FC:S=FD:GOTO1940
1960 CLOSE15:RETURN
2000 REM*****
2010 REM*   CREATE FILE ROUTINE   *
2020 REM*****
2030 GOSUB 2370:REM CREATE FILE NAME
2040 GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]"
2050 SYSPR,10,6,"[G>H]OW MANY FIELDS[4SPC][4CL]":F
2060 IF F<1ORF>30THEN2050
2070 DIMFL(F),FP(F),N$(F),Z$(F)
2080 GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]";F:"FIELDS" :D=0
2085 FORY=1TOF
2090 IFY=19 THEND=-18:GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]"
2100 SYSPR,4,Y+4+D,"FIELD":Y:SYSPR,13,Y+4+D,"NAME":N$(Y)
2110 IFLEN(N$(Y))>8THENN$(Y)=LEFT$(N$(Y),8)
2120 NEXTY:D=0:GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]";F:"FIELDS"
2125 FORY=1TOF
2130 IFY=19 THEND=-18:GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]"
2140 SYSPR,4,Y+4+D,"FIELD":Y
2145 SYSPR,13,Y+4+D,"LENGTH[6SPC][6CL]":FL(Y):IFFL(Y)>30THEN2140
2150 FP(Y)=FP(Y-1)+FL(Y-1)
2160 NEXTY:D=0
2165 FORY=1TOF:FP(Y)=FP(Y)+1:NEXTY
2170 TL=FP(Y-1)+FL(Y-1)
2180 IFTL<255THEN2220
2190 SYSPR,4,2,"[REV][BLK][2SPC]FILE TOO LONG:";
2195 PRINT"[3SPC]PRESS F1[4SPC][OFF][3SPC][3CL][GR2]"
2200 GET K1$:IFK1$<>"F1"THEN2190
2205 GOSUB6100
2210 SYSPR,4,2,"[REV][BLK][2SPC]FILE TOO LONG: AMEND[2SPC](A)[OFF][GR2]":GOTO2230
2220 GOSUB6100:SYSPR,11,2,"[REV] [G>C]REATE NEW FILE [OFF]"
2230 SYSPR,6,4,"[BLK]FIELD#[2SPC]LENGTH[GR2]"
2240 D1=0:D=0:FORY=1TOF:IFY=19 THEND=-18:D1=20:SYSPR,26,3,"FIELD#[2SPC]LENGTH"
2250 SYSPR,D1,Y+4+D,"[REV]N$(Y):SYSPR,D1+8,Y+4+D,Y:SYSPR,D1+15,Y+4+D,FL(Y)
2260 NEXTY

```

# MICROMART

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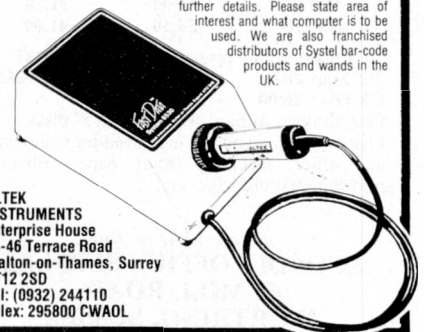
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# PROGRAM FILE

```

2270 SYSPR,6,23,"[REV] A [OFF] AMEND[3SPC]OR[3SPC][REV] C [OFF] CONTINUE";
2280 GETK2$=IPK2$<>"A"ANDK2$<>"C"THEN2280
2290 IPK2$="C"ANDTL<255THEN2350
2300 SYSPR,6,23,"AMEND WHICH FIELD#[14SPC][6CL]";:INPUTAF
2310 IFAF<10RAF>FTHEN2300
2320 SYSPR,6,23,"INPUT NEW FIELD LENGTH[9SPC][6CL]";:INPUTFL(AF)
2325 IFFL(AF)>30THEN2320
2330 TL=0:FOR Y=1TOF:FP(Y)=FP(Y-1)+FL(Y-1):NEXT Y
2335 FOR Y=1TOF:FP(Y)=FP(Y)+1:NEXT Y
2340 TL=FP(Y-1)+FL(Y-1)
2345 GOTO2180
2350 RETURN
2360 REM *****
2370 REM ** NEW FILE NAME **
2375 REM *****
2380 GOSUB6100:SYSPR,11,2,"[REV] NEW FILE NAME [OFF]"
2390 SYSIP,2,5,"[G>P]LEASE ENTER FILE NAME[9SPC][9CL]";:NFS
2400 IF LEN(NFS)>12THEN2370
2410 SYSPR,5,10,"[G>N]EW FILE NAME :—"
2420 SYSPR,5,12,"[REV] NFS"[REV]"
2430 SYSPR,2,15," IS NAME OK:--[REV] F1 [OFF][6SPC]NOT:--[REV] F7 [OFF]"
2440 GET K3$:IPK3$<>"F1"ANDK3$<>"F7"THEN2440
2450 IPK3$="F1"THENRETURN
2460 NFS="":GOTO2370
2500 REM*****
2510 REM* LOAD FILE FROM DISC *
2520 REM*****
2530 GOSUB6100:SYSPR,8,2,"[REV] [G>L]OAD FILE FROM DISC [OFF]"
2540 SYSIP,5,5,"[G>W]HAT IS FILE NAME":NFS
2570 SYSPR,5,8,"[REV] NFS"[OFF]";:[2SPC]OK:--[2SPC][REV] F1 [OFF]";
2575 PRINT"[6SPC]NOT:--[REV] F7 [OFF]"
2580 GETK$:IPK$<>"F1"ANDK$<>"F7"THEN2570
2590 IPK$="F7"THEN2530
2600 OPEN15,8,15: OPEN4,8,4,NFS+","S,R"
2610 INPUT15,A,B$,C,D:SYSPR,5,11,"[REV] B$"[OFF]:CLOSE4:CLOSE15
2615 IFB$="OK"THEN2650
2620 SYSPR,5,15,"[G>P]RESS [REV] F1 [OFF] TO TRY AGAIN":NFS=" "
2630 GETK$:IPK$<>"F1"THEN2630
2640 GOTO2530
2650 SYSPR,5,15,"[G>P]RESS [REV] F1 [OFF] TO CONTINUE "
2660 GETK$:IPK$<>"F1"THEN2660
2670 RETURN
3000 REM*****
3010 REM* SINGLE SEARCH *
3020 REM*****
3030 GOSUB6100:SYSPR,10,2,"[2SPC][G>S]EARCH SUBJECTS[3SPC]":TC=0
3040 D=0:D1=0:FOR Y=1TOF:IFY=19THEND=-18:D1=22
3050 SYSPR,1+D1,Y+4+D,Y;:[REV] N$(Y)[OFF]":NEXT
3060 SYSPR,9,0,"[REV] [G>I]NPUT SEARCH SUBJECT [G>N]O.[OFF]";:SYSIP,33,0,"";:SS
3070 IFSS<10RSS>FTHEN3030
3080 N$=N$(SS)
3090 REM
3100 GOSUB 6100:SYSPR,4,2,"[24SPC]"
3110 SYSPR,4,2," [G>S]EARCH SUBJECT :- [REV]";:N$[OFF]"
3120 SYSIP,1,0,"[NAME]= OR [NAME*]<> "":SNS
3125 Q$=RIGHT$(SNS,1):SNS=LEFT$(SNS,LEN(SNS)-1)
3130 IFLEN(SNS)>FL(SS)THENSNS=LEFT$(SNS,FL(SS))
3150 SYSPR,1,0," [REV] SNS";:[OFF][28SPC]"
3160 SYSPR,(LEN(SNS)+3),0," OK (Y/N) ";
3170 GETK$:IPK$="Y"THEN3200
3180 IPK$="N"THEN3030
3190 GOTO3170
3200 SYSPR,4,5,"[G>S]EARCHING ***"
3210 R=0 :REM** NO OF RECORDS FOUND
3220 FORSR=1TOX-1:SYSPR,20,5,SR
3230 T=IX(2,SR):S=IX(3,SR)
3240 GOSUB1600:Z$=Z$(SS)
3250 IFZ$<>SNSANDQ$=" "THEN3270
3255 IFZ$ =SNSANDQ$=" "THEN3270
3260 R=R+1:SR(R)=SR
3270 SYSPR,10,11,"RECORDS FOUND = ";R:NEXT
3280 SYSPR,10, 9,"[REV] SEARCH COMPLETE [OFF]"
3290 SYSPR,10,11,"RECORDS FOUND = ";R
3300 IFR<>0THEN3340
3310 SYSPR,5,24,"PRESS [REV] F1 [OFF] FOR MENU";
3320 GETK$:IPK$<>"F1"THEN 3320
3330 RETURN
3340 SYSPR,0,13,"PAGE THROUGH +1";:[REV](F1)"
3350 PRINT,"PAGE THROUGH +5";:[REV](F3)"
3360 PRINT,"PAGE THROUGH -1";:[REV](F5)"
3370 PRINT,"PAGE THROUGH -5";:[REV](F7)"
3380 PRINT,"EXIT TO MENU";:[3SPC][REV](←) [OFF]"
3390 GETK$:IPK$="F1"THENPG=PG+1:GOTO3450
3400 IPK$="F3"THENPG=PG+5:GOTO3450
3410 IPK$="F5"THENPG=PG-1:GOTO3450
3420 IPK$="F7"THENPG=PG-5:GOTO3450
3430 IPK$=←THENRETURN
3440 GOTO3390
3450 IFPG<1THENPG=1
3460 IFPG>RTHENPG=R
3470 T=IX(2,SR(PG)):S=IX(3,SR(PG))
3480 GOSUB 1600
3490 RN=SR(PG):GOSUB 3800
3500 SYSPR,9,24,"PRESS (F1-F7) OR (←)":
3510 GOTO3390
3600 REM*****
3610 REM* RECORD # SEARCH **
3620 REM*****
3630 GOSUB6100:SYSPR,3,2,"[34SPC]"
3640 SYSPR,5,2,"ENTER RECORD # NO."
3650 SYSIP,0,0,"":SR
3660 IFSR>X-1THENSR=X-1
3670 IF SR<1THENSR=1
3680 T=IX(2,SR):S=IX(3,SR)
3690 GOSUB 1600
3700 RN=SR:GOSUB3800
3710 SYSPR,9,24,"PRESS (F1-F7) OR (←)":
3720 GETK$:IPK$="F1"THENSR=SR+1:GOTO3660
3730 IPK$="F5"THENSR=SR-1:GOTO3660
3740 IPK$="F3"THENSR=SR+5:GOTO3660
3750 IPK$="F7"THENSR=SR-5:GOTO3660
3760 IPK$=←THENRETURN
3770 GOTO3720
3800 REM*****
3810 REM* PRINT DATA TO SCREEN *
3820 REM*****
3830 GOSUB6100:SYSPR,11,2,"[REV] [G>R]ECORD [G>N]O. :- ";RN[OFF]":D=0
3835 FOR Y=1TOF
3840 IF Y=19THEND=-18:GOSUB6100:SYSPR,11,3,"[REV] [G>R]ECORD [G>N]O. :- ";RN[REV]"
3845 IF Y=18ANDY=18THENG$=SYSPR,5,23,"(F7) PAGE+":IPK$<>"F7"THEN3845

```



# PROGRAM FILE

```

3850 SYSPR,0,Y+4+D,"[BLK]"NS(Y)"[GR2]",ZS(Y):NEXT
3853 IFP>18THEN SYSPR,5,23,"[REV] F1 [OFF] MENU[6SPC][REV] F7 [OFF] TURN PAGE";
3855 IFP>18THENGETKS:IFKS="F7"THEN3830
3860 IFP>18ANDKS<>"F1"THEN3855
3865 SYSPR,5,23,"[36SPC]";
3870 RETURN
4000 REM*****
4010 REM** ENTER NEW DATA **
4020 REM*****
4030 GOSUB6100:SYSPR,10,2,"[REV][2SPC]ENTER NEW DATA[2SPC][OFF]"
4040 SYSPR,12,4,"[REV] RECORD# ";X[OFF]"
4050 D=0:FOR Y=1TOF
4060 IF Y=19THEN D=-18:GOSUB6100:SYSPR,10,2,"[REV][2SPC]ENTER NEW DATA[2SPC][OFF]"
4070 SYSPR,2,Y+4+D,"[REV]"NS(Y)"[OFF]:SYSIP,LEN(NS(Y))+6,Y+4+D,"";ZS(Y):NEXT Y
4080 FOR Y=1TOF:IF LEN(ZS(Y))>FL(Y)THEN ZS(Y)=LEFT$(ZS(Y),FL(Y)):NEXT Y
4130 GOSUB1400
4140 RETURN
4200 REM*****
4210 REM* AMEND RECORD ROUTINE *
4220 REM*****
4230 GOSUB6100:SYSPR,11,2,"[REV] [G>A]MEND RECORD [OFF]"
4240 SYSIP,11,5,"[G>R]ECORD [G>N]O ";RN
4250 IPRN<1THENRN=1
4260 IPRN>X-1THENRN=X-1
4265 SYSPR,21,5,"[4SPC][4CL]";RN
4270 T=IX(2,RN):S=IX(3,RN)
4300 GOSUB1600:AF=1
4310 SYSPR,0,7,"[47SPC]"
4320 SYSPR,0,7,AF,"[REV]"NS(AF)"[OFF]:SYSPR,10,7,ZS(AF)
4350 SYSPR,9,18,"[REV] F1 [OFF] TO PAGE FIELDS +"
4360 SYSPR,9,19,"[REV] F5 [OFF] TO PAGE FIELDS -"
4370 SYSPR,9,20,"[REV] <[2SPC][OFF] [G>R]ETURN TO MENU"
4380 SYSPR,9,21,"[REV] F7 [OFF] [G>A]MEND FIELD "
4385 SYSPR,9,22,"[REV] F8 [OFF] [G>S]AVE NEW DATA"
4390 GETKS:IFKS="F1"THENAF=AF+1:GOTO4500
4400 IFKS="F5"THENAF=AF-1:GOTO4500
4410 IFKS="<"THENRETURN
4415 IFKS="F8"THEN4600
4420 IFKS">"F7"THEN4390
4430 SYSIP,0,10,"[REV] [G>N]EW DATA ";ZS(AF)
4440 IF LEN(ZS(AF))>FL(AF)THEN ZS(AF)=LEFT$(ZS(AF),FL(AF))
4450 SYSPR,0,10,"[62SPC]"
4500 IF AF<1THENAF=1
4510 IF AF>FTHENAF=F
4520 GOTO4310
4600 REM ** REPLACE DATA **
4605 TX=X:RN=RN
4610 GOSUB1430
4620 X=TX
4660 RETURN
5000 REM*****
5010 REM* FULL DISC *
5020 REM*****
5030 GOSUB6100:SYSPR,11,2,"[REV][BLK] DISC NOW FULL [OFF]"
5040 X=MAX:GOSUB1000
5070 SYSPR,5,7,"[G>Y]OU NOW NEED AN EMPTY,FORMATTED"
5080 SYSPR,5,9,"[DISC WHICH MUST HAVE FILE NAME :-"
5085 SYSPR,16,11,"[REV]"NFS"[OFF]"
5090 SYSPR,5,13,"[OFF]CREATED [REV]BEFORE[OFF] ANY DATA"
5100 SYSPR,5,15,"CAN BE ENTERED"
5110 SYSPR,9,23,"[GR2][G>P]RESS [REV] F1 [OFF] TO CONTINUE"
5120 SYSPR,6,21,"[GR2][G>P]UT NEW DISC INTO DRIVE THEN"
5130 GETKS:IFKS">"F1"THEN5120
5140 T=1:S=1:TX=1:X=MAX:GOSUB1000:X=TX:GOTO300
6100 REM *** BLANK MENU PAGE ***
6110 PRINTCHR$(147);
6120 PRINT"[CD][G>A][37G>*][G>S]"
6130 PRINT"[G>-][37SPC][G>-]"
6140 PRINT"[G>2][37G>*][G>X]"
6145 SYSPR,19-LEN(NFS)/2,1,"[REV][BLK]"NFS"[REV][GR2]"
6150 RETURN
7000 REM**** M/C FOR SYSPR,IP ****
7010 D=0:PR=49152:IP=PR+26
7020 READA:IPA=-1THENRETURN
7030 POKE49152+D,A:D=D+1:GOTO7020
7040 DATA 32,253,174,32,158,183,138,72,32,253,174,32,158,183,104,168
7050 DATA 24,32,240,255,32,253,174,76,164,170,32,253,174,32,158,183
7060 DATA 138,72,32,253,174,32,158,183,104,168,24,32,240,255,32,253
7070 DATA 174,76,195,171,165,43,164,44,133,34,132,35,160,3,200,177
7080 DATA 34,208,251,200,152,24,101,34,160,0,145,43,165,35,105,0
7090 DATA 200,145,43,136,162,3,230,34,208,2,230,35,177,34,208,244
7100 DATA 202,208,243,165,34,105,2,133,45,165,35,105,0,133,46,76
7110 DATA 99,166,-1
7120 REM*****

```

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2. Screen title: printed centrally on the display top line
  3. Input text: choose the text and its location
  4. Input type: real, integer, alpha-numeric, specific or untested
  5. Input box: choose location and length of the reply boxes
  6. Input limits: inputs may have HI/LO or STRING limits
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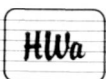
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existing data files may be reloaded to the designer for further editing.

Positive and negative numbers may be used by the input routine depending on the limits specified in the designer; for example, LO=-100 HI=50, then any number within limits is allowed.

Specific strings may be single characters or groups of characters; the groups do not all need to be the same length.

When entering real (decimal) numbers the input routine tests for the number of digits after the decimal point, and will only allow the number of digits that were entered into the 'lowest real number' when designing the input screen. If 10.00 is entered as the 'lowest real number', no more than two decimal places will be allowed by the input routine (and, of course, the input must be at least 10).

Inputs with a box length of zero are printed as text and no reply requested. This allows text to be used as sub-headers and lines of, say, dashes used to improve the layout.

In 80-column modes the bottom line is used as a status line showing the input type and limits, and also any help message. In 40-column modes the help message is printed on the line above the status line. Therefore, if help messages are to be used in 40-column modes no input should be placed on this line.

In mode 7 colour may be placed in the text by use of function keys f1 to f7; a change of colour after the text will allow the input to be in a different colour to the text.

Screen Designer instructions are given on the status line in order that the screen layout can be seen as it's built up. Because of this, and the need to conserve memory, instructions are restricted to the minimum.

#### Input/validation

This is intended to be incorporated in your own programs. PROCinit loads the specified file, which includes the screen mode and number of items as well as input types and limits. PROCsetup-screen simply prepares the screen for input by printing the title, input text and boxes. It has been included as a separate routine so that in programs where information has been saved and is being retrieved, it can be presented on the screen in the same format as it was input.

PROCinput gets and checks each input, printing the limits and help message for each item on the status line, when the cursor is in the input box for that item.

Move down from item to item with the return key (the cursor keys will allow movement up as well as down). You won't be able to move from out of limit boxes except by cheating (press ^C)! When the screen has been completed, pressing 'TAB' will leave the procedure and continue the program. Any items out of limits will ring the bell and print a message on the status line and you'll be asked if you want to proceed with the program or continue the input.

PROCinput includes a REM showing how the 'TAB' can be replaced by another key to end the routine, and also a REM showing how to disable the 'cheating' control. It may be a good idea to use a 'text only' input to tell users how to leave the input routine.

PROCvariables takes the answers from the input routine and assigns them to your own variables for use in other parts of your program. This can be omitted and the answers used directly if required.

```

10REM DESIGN BBC MICRO 32K
20REM IF YOU HAVE DISCS AND WILL USE MODE0,1 OR 3 RELOCATE TO &1500
30MODE6
40PROCinit
50PROColdnew
60IF mode=99 PROCwhatmode
70MODE mode
80mchange=0
90PROCrefresh
100REPEAT
110PROCeditor:IF mchange=1 MODE mode:mchange=0:PROCrefresh:GOTO110
120I=1:IF I>=30 I=30:PROCnomore:IF mchange=1 MODE mode:mchange=0:PROCrefresh:GOTO120
130PROCmsg("CTL=CURSOR. MOVE TO TEXT START, RETURN")
140PRINTTAB(0,0)
150PROCcur
160X(I)=X:Y(I)=Y
170PROCmsg("CTL=KEYBOARD. ENTER TEXT, RETURN")
180PRINTTAB(X,Y)
190PROCget(11)
200txt$(I)=T$
210PROCmsg("CTL=CURSOR. MOVE TO BOX START, RETURN")
220PRINTTAB(X+LEN(txt$(I)),Y)
230PROCcur
240VDBxchr
250XB(I)=X:YB(I)=Y
260PROCmsg("CTL=CURSOR. MOVE TO BOX END, RETURN")
270PRINTTAB(XB(I),YB(I))
280PROCboxlen
290PROctype
300PROCexplain
310UNTIL FALSE
320
330DEFPROctype
340PROCmsg("1=INT 2=REAL 3=$ 4=SPECIFIC 5=NO TEST ")
350REPEAT A=GET-48:UNTIL A>0 AND A<6
360IF A=3 PROCmsg("INPUT=STRING, RETURN TO GO ON"):REPEAT T=GET:UNTIL T=13
370IF A=5 PROCmsg("NO TEST ON INPUT, RETURN TO GO ON"):REPEAT T=GET:UNTIL T=13
380typ(I)=A
390X=XB(I)+1:Y=YB(I)
400IF A=1 PROCintlimit
410IF A=2 PROCreallimit
420IF A=4 PROCspecificlimit
430ENDPROC
440

```



```

450DEFPROCcur
460REPEAT
470A=GET
480IF A=139 AND VPOS>0 VDU11
490IF A=136 AND POS>0 VDUB
500IF A=137 AND POS<11 VDU9
510IF A=138 AND VPOS<(15-1) VDU10
>
520X=POS : Y=VPOS
530UNTIL A=13
540ENDPROC
550
560DEFPROCmsg(T$)
570PRINTTAB(0,15);STRING$(11," ");TAB(0,15);T$;
580ENDPROC
590
600DEFPROCboxlen
610L=0 : num=49
620IF mode=0 OR mode=3 PRINTTAB(60,15);"LENGTH : ";L; " ";
630PRINTTAB(X+1,YB(I));
640REPEAT
650A=GET
660IF A=136 AND L>0 VDU127 : L=L-1 : num=num-1
670IF A=137 VDUnum : L=L+1 : num=num+1
680IF L=0 num=49
690IF num<48 num=num+10
700IF num=58 num=48
710X=POS
720IF mode=0 OR mode=3 PRINTTAB(60,15);"LENGTH : ";L; " ";
730PRINTTAB(X,YB(I));
740UNTIL A=13
750len(I)=POS-XB(I)-1
760VDubxchr
770ENDPROC
780
790DEFPROCintlimit
800PROCmsg("LOWEST ALLOWABLE INTEGER, RETURN")
810PRINTTAB(X,Y);SPC(len(I));TAB(X,Y);
820PROCget(len(I))
830LIML=T$
840PROCmsg("HIGHEST ALLOWABLE INTEGER, RETURN")
850PRINTTAB(X,Y);SPC(len(I));TAB(X,Y);
860PROCget(len(I))
870lim$(I)=LIML+" "+T$
880ENDPROC
890
900DEFPROCrealimit
910PROCmsg("LOWEST ALLOWABLE REAL, RETURN")
920PRINTTAB(X,Y);SPC(len(I));TAB(X,Y);
930PROCget(len(I))
940LIML=T$
950PROCmsg("HIGHEST ALLOWABLE REAL, RETURN")
960PRINTTAB(X,Y);SPC(len(I));TAB(X,Y);
970PROCget(len(I))
980lim$(I)=LIML+" "+T$
990ENDPROC
1000
1010DEFPROCspecificlimit
1020T=0 : lim$(I)=""
>
1030REPEAT : T=T+1
1040PROCmsg("ENTER STRING No "+STR$(T)+" OR 'RETURN'")
1050PRINTTAB(X,Y);SPC(len(I));TAB(X,Y);
1060PROCget(len(I))
1070lim$(I)=lim$(I)+T$+" "
1080UNTIL T$=""
1090lim$(I)=LEFT$(lim$(I),LEN(lim$(I))-2)
1100ENDPROC
1110
1120DEFPROCexplain
1130IF 11=79 PROCmsg("ENTER HELP MESSAGE : ")
1140IF 11=39 PROCmsg("ENTER HELP MESSAGE ON LINE ABOVE");PRINTTAB(0,15-1);
1150PROCget(39)
1160h$(I)=T$
1170IF 11=39 PRINTTAB(0,15-1);SPC(LEN(h$(I)));
1180ENDPROC
1190
1200DEFPROCget(mx%)
1210T$="" : A=0
1220REPEAT
1230A$=GET$
1240IF mode=7 AND A$<>CHR$13 AND A$<>CHR$128 AND A$<>CHR$136 GOTO1260
1250IF A$<>CHR$13 AND (A$<>CHR$32 OR A$<>CHR$127) UNTILFALSE
1260IF A$=CHR$13 A=1 : A$=""
1270IF A$=CHR$127 AND LEN(T$)>0 T$=LEFT$(T$,LEN(T$)-1);PRINT;CHR$127;A$=""
ELSE IF A$=CHR$127 AND LEN(T$)=0 VDU7;A$=""
1280IF A=0 AND LEN(T$)=mx% VDU7 ELSE T$=T$+A$;PRINT;A$;
1290UNTIL A=1
1300ENDPROC
1310
1320DEFPROCeditor
1330FOR L=1 TO I
1340IF len(L)>0 PRINTTAB(XB(L)+1,YB(L));STRING$(len(L),STR$(L MOD10));
1350NEXT
1360items=I
1370PROCmsg("TAB=EDIT RETURN=NEXT ")
1380I=items
1390FX15,0
1400A=GET : IF A=13 : ENDPROC
1410REPEAT
1420PROCmsg("EDIT 0 TO "+STR$(I)+" , (0=SAVE/PRINT/MODE/ETC)")
1430PROCget(2)
1440A=VAL(T$)
1450UNTIL A=0 OR A<=I
1460I=A
1470IF I=0 PROCeditor2;IF mchange=1 I=items;ENDPROC ELSE IF I=0 GOTO1370
1480REPEAT
1490PROCmsg("EDIT 1=TEXT 2=POS 3=TYPE 4=LIMIT 5=MSG")
1500REPEAT A=GET-48 : UNTIL A>0 AND A<6
1510ON A GOSUB 1570,1670,1930,1960,1990
1520PROCmsg("TAB TO EDIT ITEM "+STR$(I)+" MORE OR RETURN")
1530REPEAT A=GET : UNTIL A=9 OR A=13
>
1540UNTIL A=13
1550PROCrefresh
1560GOTO1370
1570PRINTTAB(X(I),Y(I));SPC(LEN(txt$(I)));
1580IF POS=XB(I) VDUBxchr
1590T$=POS
1600PROCmsg("ENTER NEW TEXT, RETURN")
1610PRINTTAB(X(I),Y(I));
1620PROCget(11)

```

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```

1630txt$(I)=T$
1640IF POS>XB(I) XB(I)=POS:PRINTTAB(XB(I),YB(I));CHR$bxchr;SPC(len(I));CHR$
bxchr;
1650txt$(I)=T$
1660RETURN
1670PROCmsg("1=TXT POS 2=BOX POS 3=BOX LEN")
1680REPEAT A=GET-48 : UNTIL A>0 AND A<4
1690ON A GOSUB 1710,1780,1850
1700RETURN
1710PROCmsg("CTL:CURSOR. MOVE TO TEXT START, RETURN")
1720PRINTTAB(X(I),Y(I));
1730PROCcur
1740PRINTTAB(X(I),Y(I));SPC(LEN(txt$(I)));
1750X(I)=X : Y(I)=Y
1760PRINTTAB(X(I),Y(I));txt$(I);
1770RETURN
1780PROCmsg("CTL:CURSOR. MOVE TO BOX START, RETURN")
1790PRINTTAB(XB(I),YB(I));
1800PROCcur
1810PRINTTAB(XB(I),YB(I));SPC(len(I)+2);
1820XB(I)=X : YB(I)=Y
1830PRINTTAB(XB(I),YB(I));CHR$bxchr;SPC(len(I));CHR$bxchr;
1840RETURN
1850PROCmsg("CTL:CURSOR. MOVE TO BOX END, RETURN")
1860PRINTTAB(XB(I),YB(I));SPC(len(I)+2);
1870PRINTTAB(XB(I),YB(I));CHR$bxchr;
1880X=POS-1
1890PROCboxlen
1900PROCmsg("CHECK INPUTS FIT IN NEW BOX, RETURN")
1910REPEAT A=GET : UNTIL A=13
1920RETURN
1930PROCtype
1940RETURN
1950REM BASIC2 ONLY, BASIC1 USERS REPLACE WITH M/C CALL
1960BCL1("FX13B,0,"+STR$(typ(I)+4B))
1970PROCtype
1980RETURN
1990PROCexplain
2000RETURN
2010
2020DEFFPROColdnew
2030PROCmsg("LOAD A FILE Y/N ")
2040A=GET OR &20
>
2050IF A<>12: PROCnewscreen : ENDPROC
2060PROCmsg("FILE NAME : ")
2070PROCget(7)
2080ON ERROR PROCnofile : GOTO2030
2090dfiles="D."+T$
2100F=OPENIN(dfiles)
2110INPUT#F,title$,mode,I
2120items=1 : mchange=0
2130FOR L=1 TO I
2140INPUT#F,X(L),Y(L),txt$(L),XB(L),YB(L),len(L),typ(L),lim$(L),h$(L)
2150NEXT
2160CLOSE#F
2170ON ERROR OFF
2180PROCscreensize
2190ENDPROC
2200
2210DEFFPROCrefresh
2220REM green text, leave if not req'd
2230VDUI9,1,2,0,0,0
2240CLS
2250PRINTTAB(11/2-LEN(title$)/2,0);title$
2260FOR L=1 TO items
2270PRINTTAB(X(L),Y(L));txt$(L);
2280IF len(L)>0 PRINTTAB(XB(L),YB(L));CHR$bxchr;STRING$(len(L),STR$(L MOD 1
0));CHR$bxchr;
2290NEXT
2300ENDPROC
2310
2320DEFFPROCsave
2330PROCmsg("FILE NAME (RETURN to skip) ")
2340PROCget(7)
2350IF T$="" ENDPROC
2360I=items
2370dfiles="D."+T$
2380F=OPENOUT(dfiles)
2390PRINT#F,title$,mode,I
2400FOR L=1 TO I
2410PRINT#F,X(L),Y(L),txt$(L),XB(L),YB(L),len(L),typ(L),lim$(L),h$(L)
2420NEXT
2430CLOSE#F
2440I=0
2450ENDPROC
2460
2470DEFFPROCeditor2
2480PROCmsg("1=TITLE 2=INS/DEL 3=PRINT 4=SAVE 5=MODE")
2490REPEAT A=GET-48 : UNTIL A>0 AND A<6
2500IF A=1 PROCnewscreen
2510IF A=2 PROCadditem
2520IF A=3 PROCscreendump
2530IF A=4 PROCsave
2540IF A=5 PROCwhatmode
2550IF mchange=0 PROCrefresh
>
2560ENDPROC
2570
2580DEFFPROCnewscreen
2590PROCmsg("SCREEN TITLE:")
2600PROCget(11-13)
2610title$=T$
2620ENDPROC
2630
2640DEFFPROCadditem
2650PROCmsg("1=INSERT ITEM 2=REMOVE ITEM ")
2660REPEAT A=GET-48 : UNTIL A>0 AND A<3
2670IF A=2 PROCremoveitem : ENDPROC
2680PROCmsg("INSERT AT WHICH ITEM ")
2690PROCget(2)
2700A=VAL(T$)
2710IF A>items PROCmsg("NOT THAT MANY ITEMS, RETURN TO GO ON"):REPEAT A=GET
:UNTIL A=13:ENDPROC
2720FORL=items TO A STEP-1
2730X(L+1)=X(L):Y(L+1)=Y(L):txt$(L+1)=txt$(L):XB(L+1)=XB(L):YB(L+1)=YB(L):1
en(L+1)=len(L):typ(L+1)=typ(L):lim$(L+1)=lim$(L):h$(L+1)=h$(L)
2740NEXT
2750X(A)=0 : Y(A)=0 : txt$(A)=""
2760XB(A)=0 : YB(A)=0 : len(A)=0
2770typ(A)=0 : lim$(A)="" : h$(A)=""
2780IF items<30 items=items+1 : I=A

```



# PROGRAM FILE

```

2790PROCrefresh
2800PROCmsg("NOW EDIT ITEM "+STR$(A)+", RETURN TO GO ON")
2810REPEAT A=GET : UNTIL A=13
2820ENDPROC
2830
2840DEFPROCinit
2850*FX4,1
2860title$="" : ll=39 : ls=24
2870CLS
2880PRINT"SCREEN DESIGNER"
2890VDU23,130,16,0,16,0,16,0,16,0
2900I=31
2910DIM X(I),Y(I),txt$(I),XB(I),YB(I),len(I),typ(I),lim$(I),h$(I)
2920I=0 : items=0
2930mchange=0 : mode=99
2940ENDPROC
2950
2960DEFPROCwhatmode
2970REPEAT
2980PROCmsg("WHICH MODE (0,1,3,4,6 OR 7) ")
2990mode=GET-48
3000UNTIL mode=0 AND mode<B AND mode<>2 AND mode<>5
3010PRINT mode
3020PROCscreenize
3030mchange=1
3040ENDPROC
3050
3060DEFPROCscreenize
>
3070IF mode=0 OR mode=3 ll=79 ELSE ll=39
3080IF mode=3 OR mode=6 OR mode=7 ls=24 ELSE ls=31
3090IF mode=7 bxchr=58 ELSE bxchr=130
3100ENDPROC
3110
3120DEFPROCnomore
3130PROCmsg("EDIT/SAVE ONLY, RETURN TO GO ON")
3140REPEAT A=GET : UNTIL A=13
3150REPEAT
3160PROCeditor
3170UNTIL I<30
3180ENDPROC
3190
3200DEFPROCscreenump
3210VDU2
3220AX=135
3230FOR Y%=0 TO ls-1
3240FOR X%=0 TO ll
3250VDU31,X%,Y%
3260C=(USR(&FFF4) AND &FFFF) DIV &100
3270IF C=130 C=58
3280IF C>126 C=32
3290PRINT;CHR$(C)
3300NEXT;VDU13;NEXT
3310VDU3
3320ENDPROC
3330
3340DEFPROCremoveitem
3350PROCmsg("REMOVE WHICH ITEM ")
3360PROCget(2)
3370A=VAL(T$)
3380IF A>30 PROCmsg("TOO BIG. RETURN TO GO ON");REPEAT=GET;UNTIL A=13;ENDPROC
3390IF A>items PROCmsg("NOT THAT MANY ITEMS, RETURN TO GO ON");REPEAT=GET;UNTIL A=13;ENDPROC
3400FOR L=A TO items
3410X(L)=X(L+1):Y(L)=Y(L+1):txt$(L)=txt$(L+1):XB(L)=XB(L+1):YB(L)=YB(L+1):len(L)=len(L+1):typ(L)=typ(L+1):lim$(L)=lim$(L+1):h$(L)=h$(L+1)
3420NEXT
3430txt$(L)="" : lim$(L)="" : h$(L)=""
3440items=items-1
3450IF items<0 items=0
3460PROCrefresh
3470I=0
3480PROCmsg("ITEM "+STR$(A)+ " REMOVED RETURN TO GO ON")
3490REPEAT A=GET : UNTIL A=13
3500ENDPROC
3510
3520DEFPROCnofile
3530ON ERROR OFF
3540IF ERR<>222 END
3550PROCmsg("NO SUCH FILE - TRY AGAIN")
3560VDU7
3570A=INKEY(200)
3580ENDPROC
>
10REM INPUT/VALIDATION ROUTINE
20REM FILE NAME NEEDS TO GO IN QUOTES ON NEXT LINE
30PROCinit("TEST1")
40REM MORE PROGRAM HERE
50MODE mode
60REM THIS MAKES TEXT GREEN LEAVE OUT IF NOT REQ'D
70VDU19,1,2,0,0,0
80PROCsetupscreen
90PROCinput
100*FX4,0
110REM MORE PROGRAM HERE
120END
130
140DEFPROCsetupscreen
150CLS
160PRINTTAB(11/2-LEN(title$)/2,0);title$
170FOR L=1 TO num
180IF len(L)>0 PRINTTAB(X(L),Y(L));tx$(L);TAB(XB(L),YB(L));CHR$(bxchr)
190PRINTTAB(XB(L)+1,YB(L));ans$(L);
200NEXT
210ENDPROC
220
230DEFPROCinput
240*FX4,1
250I=0
260PROCcupdown(1)
270REPEAT
280*FX21,0
290G=GET
300IF G=127 AND (LEN(ans$(I))>0) ans$(I)=LEFT$(ans$(I),LEN(ans$(I))-1):PRI
NTTAB(XB(I)+1,YB(I));SPC(LEN(I));TAB(XB(I)+1,YB(I));ans$(I);
310IF G=139 OR G=136 PROCchk:IF ok PROCcupdown(-1)
320IF G=138 OR G=137 PROCchk:IF ok PROCcupdown(1)
330IF G=3 PROCct1C
340IF G=13 PROCchk:IF ok PROCcupdown(1)

```

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# PROGRAM FILE

```

350REM next line ends proc, change 9 to use another key
360IF G=9 PROCendchk :UNTILNOT(cheat) :ENDPROC
370IF G<32 OR G>126 UNTILFALSE
380IF stflg ans$(I)="" :PRINTTAB(XB(I)+1,YB(I));SPC(len(I));TAB(XB(I)+1,YB(I));stflg=0
390ON typ(I) GOSUB 410,490,610,690,740
400UNTILFALSE
410REM INTEGER
420IF (G<48 OR G>57) AND G<>45 VDU7:RETURN
430IF G=45 AND INSTR(ans$(I),"-") VDU7:RETURN
440IF G=45 AND (INSTR(lim$(I),"-")=0) VDU7:RETURN
450IF LEN(ans$(I))=len(I) ans$(I)=LEFT$(ans$(I),len(I)-1):VDU127
460ans$(I)=ans$(I)+CHR$(G)
470PRINT;CHR$(G);
480RETURN
490REM HERE FOR REALS
500IF (G<48 OR G>57) AND G<>46 AND G<>45 VDU7:RETURN
510IF G=45 AND INSTR(ans$(I),"-") VDU7:RETURN
>
520IF G=45 AND (INSTR(lim$(I),"-")=0) VDU7:RETURN
530IF G=46 AND INSTR(ans$(I),".") VDU7:RETURN
540t1=INSTR(lim$(I),".")-INSTR(lim$(I),".")-1
550t2=LEN(ans$(I))-INSTR(ans$(I),".")
560IF INSTR(ans$(I),".") AND (t1<t2) VDU7:PRINTTAB(0,1);SPC(11);TAB(0,1);
);** ONLY USE "t1;" DECIMAL PLACES **;G=INKEY(100):PROCcur:RETURN
570IF LEN(ans$(I))=len(I) ans$(I)=LEFT$(ans$(I),len(I)-1):VDU127
580ans$(I)=ans$(I)+CHR$(G)
590PRINT;CHR$(G);
600RETURN
610REM HERE FOR STRING
620REM IF G=(ALLOWABLE CHARACTER) GOTO620 (ALLOWS OTHER CHRS TO BE INPUT)
630IF G=38 OR G=58 OR G=49 OR G=33 GOTO 650
640IF ((G<65 OR G>90) AND (G<97 OR G>122)) AND G<>32 AND G<>44 AND G<>46 V
DU7:RETURN
650IF LEN(ans$(I))=len(I) ans$(I)=LEFT$(ans$(I),len(I)-1):VDU127
660ans$(I)=ans$(I)+CHR$(G)
670PRINT;CHR$(G);
680RETURN
690REM HERE FOR SPECIFIC
700ans$(I)=ans$(I)+CHR$(G)
710IF (INSTR(lim$(I),ans$(I)))=0 ans$(I)=LEFT$(ans$(I),LEN(ans$(I))-1):VDU
7:RETURN
720PRINT;CHR$(G);
730RETURN
740REM HERE TYPE 5
750REM NO TEST AT ALL
760IF LEN(ans$(I))=len(I) ans$(I)=LEFT$(ans$(I),len(I)-1):VDU127
770ans$(I)=ans$(I)+CHR$(G)
780PRINT;CHR$(G);
790RETURN
800
810DEFPROCcur
820PROCcoff
830COLOUR129:COLOUR0
840PRINTTAB(0,1);SPC(11);TAB(0,1);
850IF typ(I)=1 PRINT;" Integer, range:";lim$(I);SPC(11-23-LEN(lim$(I)));
860IF typ(I)=2 PRINT;" Decimal, range:";lim$(I);SPC(11-25-LEN(lim$(I)));
870IF typ(I)=3 PRINT;" Alphabet only";SPC(11-14);
880IF typ(I)=4 AND LEN(lim$(I))<33 PRINT;" Only :";lim$(I);SPC(11-7-LEN(lim$(I)));
ELSE IF typ(I)=4 PRINT" SPECIFIED CHARACTERS ONLY";SPC(11-26);
890IF typ(I)=5 PRINT;" Any characters and nums";SPC(11-27);
900IF 11=39 AND hlp$(I)<>" PRINTTAB(0,1);SPC(39);TAB(0,1);hlp$(I);
ELSE IF hlp$(I-1)<>" COLOUR128:COLOUR1:PRINTTAB(0,1);SPC(39);COLOUR129:
COLOUR0
910IF 11=79 PRINTTAB(40,1);hlp$(I);
920COLOUR128:COLOUR1
930PRINTTAB(XB(I)+1,YB(I));
940stflg=1
950PROCcon
960ENDPROC
970
980DEFPROCchk
990ON typ(I) GOSUB1050,1050,1110,1150,1110
1000IF ok ENDPROC
1010VDU7
1020PRINTTAB(XB(I)+1,YB(I));SPC(len(I));TAB(XB(I)+1,YB(I));
>
1030ans$(I)=""
1040ENDPROC
1050REM CHECK INTEGER & REAL
1060ok=TRUE
1070IF VAL(ans$(I))<VAL(LEFT$(lim$(I),INSTR(lim$(I),"-")-1)) ok=FALSE
1080IF VAL(ans$(I))>VAL(RIGHT$(lim$(I),LEN(lim$(I))-INSTR(lim$(I),"-")) ok
=FALSE
1090IF ans$(I)="" ans$(I)="0":PRINTTAB(XB(I)+1,YB(I));ans$(I)
1100RETURN
1110REM CHECK STRING & NO TEST
1120REM IF IT GETS HERE MUST BE OK
1130ok=TRUE
1140RETURN
1150REM CHECK SPECIFIC
1160ok=TRUE
1170IF ans$(I)="" ans$(I)=CHR$35
1180tmp1$="+lim$(I)+",
1190tmp2$="+ans$(I)+",
1200IF INSTR(tmp1$,tmp2$)=0 ok=FALSE
1210RETURN
1220
1230DEFPROCinit(dfile$)
1240CLS
1250VDU23,130,16,0,16,0,16,0,16,0
1260*FX214,1
1270*FX213,200
1280*FX229,0
1290REM IF FX229,1 ESCAPE=DISABLED
1300F=OPENIN("D."+dfile$)
1310INPUT#F,title$,mode
1320IF mode=0 OR mode=3 11=79 ELSE 11=39
1330IF mode=3 OR mode=6 OR mode=7 1s=24 ELSE 1s=31
1340IF mode=7 bxchr=58 ELSE bxchr=130
1350INPUT#F,num
1360I=num
1370DIM X(I),Y(I),tx$(I),XB(I),YB(I),len(I),typ(I),lim$(I),hlp$(I),ans$(I)
1380FOR L%=1 TO num
1390INPUT#F,X(L%),Y(L%),tx$(L%),XB(L%),YB(L%),len(L%),typ(L%),lim$(L%),hlp$(L%)
1400NEXT
1410CLOSE#F
1420ENDPROC
1430
1440DEFPROCct1C

```



# PROGRAM FILE

```

1450REM ENDPROC HERE TO STOP ^C CHEATING
1460T$=ans$(I)
1470PROCchk
1480IF ok PROCupdown(1):ENDPROC
1490PROCcoff
1500PRINTTAB(0,1$);SPC(11);
1510PRINTTAB(0,1$);" ** INPUT ";STR$(I);" OUT OF LIMITS **";
1520VDU7
1530B=INKEY(100)
>
1540PROCcon
1550PRINTTAB(XB(I)+1,YB(I));T$;
1560ans$(I)=T$
1570PRINTTAB(0,1$);SPC(11);
1580PROCupdown(1)
1590ENDPROC
1600
1610DEFPROCendchk
1620PROCcoff
1630cheat=FALSE
1640FORI=1 TO num
1650IF len(I)=0 GOTO1680
1660PROCchk
1670IF NOT(ok) PRINTTAB(0,1$);SPC(11);TAB(0,1$);" ** INPUT ";STR$(I);" OUT
OF LIMITS **";VDU7;B=INKEY(100);cheat=TRUE
1680NEXT
1690PROCcon
1700IF NOT(cheat) ENDPROC
1710REM NEXT LINE PREVENTS LEAVING PROCinput WITH OUT OF LIMIT ITEMS
1720REM GOTO1750
1730PRINTTAB(0,1$);SPC(11);TAB(0,1$);" CONTINUE PROGRAM? Y/N ";
1740B=GET OR &20
1750IF B=121 cheat=FALSE
1760I=0 : PROCupdown(1)
1770PROCcur
1780ENDPROC
1790
1800DEFPROCupdown(N)
1810REPEAT
1820I=I+N
1830IF I<1 I=num
1840IF I>num I=1
1850UNTIL len(I)>0
1860PROCcur
1870ENDPROC
1880
1890DEFPROCcon
1900VDU23,1,1;0;0;0;
1910ENDPROC
1920
1930DEFPROCcoff
1940VDU23,1,0;0;0;0;
1950ENDPROC
1960
1970DEFPROCvariable**
1980REM THIS IS AN EXAMPLE OF HOW TO GET YOUR OWN VARIABLES ASSIGNED
1990my_variable_string$=ans$(1)
2000my_variable_integer%=VAL(ans$(2))
2010my_variable_real=VAL(ans$(3))
2020REM AND SO ON
2030ENDPROC
>

```



## BBC 'G' by Phillip Wright

'G' is a compiler/interpreter for a simple graphics language, which allows complex graphics to be converted into fast machine code.

'G' programs consist of a series of graphics commands which are fully explained in the first program. This should be typed in and saved before the second program, called G-PART2.

When you have typed in a 'G' program (by typing "PROG", then return, and then entering your program), you can test it before compiling by

typing "GO". Once you are satisfied with the program type "COMPILE" and follow the instructions.

As in Basic programs, single commands can be entered directly instead of as part of a program. To do this you must be in mode 5, then you should type "GRAPH".

Finally, even though 'G' allows \* commands, you shouldn't \*RUN a 'G' program as this will result in some curious errors.

```

10 REM G - The simple Graphics Language
20 REM Compiler/Interpreter V.1.6
30 REM Instructions V.1.2
40 REM Written by P.J.Wright AGE12.
50 REM
60 REM INSTRUCTIONS
70 REM -----
80 *FX225,224
90 *FX226,234
100 *FX227,244
110 MODE7
120 PROCinst
130 CLS
140 PAGE=1900
150 CHAIN"G-PART2"
160 REM
170 *FX15
180 DEFPROCinst
190 PRINT TAB(14,0);CHR$(141);CHR$(129);" ** G **"
200 PRINT TAB(14,1);CHR$(141);CHR$(131);" ** G **"
210 PRINT TAB(10,2);CHR$(135);"Written By P.Wright"
220 FOR F% = 0 TO 3
230 PRINT TAB(0,F%);CHR$(132);CHR$(157)
240 NEXT
250 IF FNyn=0 THEN ENDPROC

```

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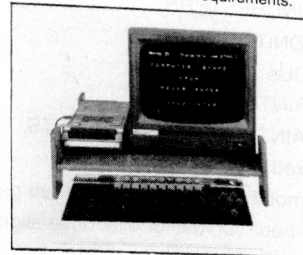
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## PROGRAM FILE

```

260 CLS
270 PROCRe(23):*FX15
280 *FX15
290 REPEATUNTILGET=32
300 PROCRe(29):*FX15
310 REPEATUNTILGET=32
320 PROCRe(31):*FX15
330 REPEATUNTILGET=32
340 PROCRe(24):*FX15
350 REPEATUNTILGET=32
360 PROCRe(25):*FX15
370 REPEAT
380 *FX15
390 A=GET
400 UNTIL A=89 OR A=78
410 IF A=89 THEN RESTORE:CLS:GOTO 270
420 ENDPROC
430 DATA "#3","COMMANDS (These Can be compiled,),"#3,"----- "
440 DATA "#6","MOVE [x] , [y]","As the BASIC command MOVE x,y"
450 DATA "#6","DRAW [x] , [y]","As the BASIC command DRAW x,y"
460 DATA "#6","PLOT [n] , [x] , [y]","As the BASIC command PLOT n,x,y"
470 DATA "#6","WRITE "[string]"","Like PRINT, but at graphics cursor."
480 DATA "#6","CLR","Clears the screen."
490 DATA "#6","FCOL [col. number]","Sets the FOREGROUND colour."
500 DATA "#6","BCOL [col. number]","Sets the BACKGROUND colour."
510 DATA "#6","SWAP [col. number],[col. number]","Like VDU 19 commands."
520 DATA "#6","DCHAR [char num.] , [num] , [num] ETC.","As VDU 23."
530 DATA ""
540 DATA "#6","And any '*' command. e.g. *TAPE,*FX9,1"
550 DATA "#5","PRESS 'SPACE' TO CONTINUE"
560 DATA "","#3","COMMANDS (These Can't be compiled,"
570 DATA "#3","----- but are used in Direct mode.)"
580 DATA "#6","DIR","Catalog Disk or Tape."
590 DATA "#6","TXT","Clear the screen and enter Mode 7"
600 DATA "#6","GRAPH","Clear the screen and enter Mode 5"
610 DATA "#6","PROG","Lets you start, or continue a G Program"
620 DATA "#6","EDIT","Edits a G program."
630 DATA "#6","COMPILE","COMPILES a G program"
640 DATA "#6","GO","INTERPRETS a G program."
650 DATA "#6","LIST / LLIST","Lists your program to screen / printer."
660 DATA "#6","BYE","Return to BASIC."
670 DATA "","#5","PRESS 'SPACE' TO CONTINUE"
680 DATA "","#3","COMMANDS (These Can't be compiled,"
690 DATA "#3","-Cont.-- but are used in Direct mode.)",""
700 DATA "#6","LOAD","Load a G. source program"
710 DATA "#6","SAVE","Save a G. source program"
720 DATA ""
730 DATA "#3","ERROR MESSAGES","-----"
740 DATA "#2","Missing """,e.g. WRITE HELLO""
750 DATA "","#2","Mistake at line xxx"
760 DATA "Occurs when compiling or interpreting."
770 DATA "correct the error using EDIT."
780 DATA "","#2","Unknown Command.", "An unrecognised command has been given."
790 DATA "","#5","PRESS 'SPACE' TO CONTINUE"
800 DATA "","#3","ERROR MESSAGES cont.", "-----"
810 DATA "","#2","Missing sp. Character"
820 DATA "ALL commands with parameters must have"
830 DATA "a space between then command and the","first parameter."
840 DATA "","#2","No program space.", "No memory left for your program."
850 DATA "","#2","No program.", "You have tried to LIST or EDIT a non","existan
t program."
860 DATA "","#2","OS ERROR:", "All O.S. errors.e.g.Bad Filename,Escape."
870 DATA "","#5","PRESS 'SPACE' TO CONTINUE"
880 DATA "","#3","USER DEFINED GRAPHICS"
890 DATA "","Although U.D.G.s can be defined using"
900 DATA "DCHAR, no facility has been made for a "
910 DATA "CHR$(x) command in WRITE. So,to print"
920 DATA "a U.D.G. the red function keys have","been set to produce the charact
er ","codes 224 to 253. thus:"
930 DATA "#1","f0 is CHR$(224)","#1","CTRL-f0 is CHR$(244)","#1","SHIFT-f0 is
CHR$(234)"
940 DATA "","#3","N.B. The last line of any G program ","#3","must be ""END""
950 DATA ""
960 DATA "#6","PRESS ""N"" TO CONTINUE. ""Y"" TO READ THE","#6","INSTRUCTIONS
AGAIN."
970 DATA ""
980 REM
990 REM
1000 DEFPROCRe(X)
1010 FOR LI=1 TO X
1020 READ P$
1030 IF LEFT$(P$,1)="#" THEN VDU (128+VAL(RIGHT$(P$,LEN(P$)-1))):GOTO 1020
1040 PRINTP$
1050 NEXT
1060 ENDPROC
1070 DEF FNyn
1080 PRINT TAB(10,10):CHR$(130):"Instructions (Y/N)?"
1090 *FX15
1100 A=GET
1110 IF A=78 THEN =0
1120 IF A=89 THEN =1
1130 GOTO 1090

0 *: G VERSION 1.6 :*
5 *:
10 *: Written By :*
15 *: P. J. Wright :*
20 *:
25 *: Save as :*
26 *: "G-PART2" :*
30 *:
32IF PAGE<>1900 THEN PRINT"Page should be 1900 !!!":END
35DIM D$(60)
40FORFX=0TO60:D$(FX)=STRING$(40," "):NEXT
45ON ERROR GOTO 1115
50MODE7:CO=FALSE:MZ=7:FC=7:BC=1:PLZ=0:PROctitle
55PROCinput:IF A$="" THEN GOT055
60ER=TRUE
65PROCcommand:IF ER=TRUE THEN PROCERROR("Unknown Command.")
70IF ER=7 THEN MODE7:MZ=7
75IF ER=2 THEN MODE5:MZ=2:VDU 28,0,31,19,24
80IF ER=3 THEN MODE5:PROCexec:A=GET:MODE7
85PROCok:GOT055
90DEFPROCplot (VZ)
95LOPT2
100LD#25:JSR&FFEE
105LD#VZ:JSR&FFEE
110LD#WZ:JSR&FFEE
115LD#XZ:JSR&FFEE
120LD#YZ:JSR&FFEE
125LD#ZV:JSR&FFEE

```



# PROGRAM FILE

```
1301
135ENDPROC
140DEFPROCpsep
145VZ=0
150IF LEFT$(A$,5)="MOVE " THEN VZ=4
155IF LEFT$(A$,5)="DRAW " THEN VZ=5
160IF LEFT$(A$,5)="PLOT " PROCplo
165IF VZ=0 THEN PROCERRR("Missing sp Character"):ENDPROC
170BZ=FNfind(A$," ",1)
175BZ=RIGHT$(A$,LEN(A$)-BZ)
180DZ=FNfind(B$,".",1)
185YZ=VAL(RIGHT$(B$,LEN(B$)-DZ)) MOD 256
190YZ=VAL(RIGHT$(B$,LEN(B$)-DZ)) DIV 256
195WZ=VAL(LEFT$(B$,DZ-1)) MOD 256
200XZ=VAL(LEFT$(B$,DZ-1)) DIV 256
205IF CO=FALSE THEN PZ=&1100
210PROCplot(VZ)
215IF CO=FALSE THEN PROCcall
220ENDPROC
225DEF FNfind(C$,D$,EZ)
230A=1
235IF MID$(C$,A,1)=D$ THEN A=A+1
240A=A+1
245IF A>LEN(C$) THEN =0
250GOTO 235
255DEFPROCERRR(Z$)
260PRINT
265IF MZ=7 THEN VDU129 ELSE COLOUR 1
270PRINTZ$
275IF MZ=2 THEN COLOUR FC
276CO=FALSE
280ENDPROC
285DEFPROCinput
290PRINT:;
295A$=""
300AA=GET
305IF A$="" AND AA=127 THEN GOTO 300
310IF AA=127 THEN A$=LEFT$(A$,LEN(A$)-1):VDU AA:GOTO300
315VDU AA
320IF AA=13 THEN ENDPROC
325A$=A$+CHR$(AA)
330GOTO 300
335DEFPROCtitle
340PRINTCHR$131:; *G* Version 1.6"
345PRINTCHR$130;"Written by Phil Wright"
350PROCok
355ENDPROC
360DEFPROCok
365PRINT "Ready."
370ENDPROC
375DEFPROCcall
380PZ=&60
385CALL&1100
390ENDPROC
395DEFPROCcommand
400SOUND 1,-13,10,1
405IF ASC(A$)=42 THEN ER=FALSE:PROCst
410IF LEFT$(A$,4)="MOVE" OR LEFT$(A$,4)="DRAW" OR LEFT$(A$,4)="PLOT" THEN ER=FALSE:PROCpsep
415IF A$="TXT" THEN ER=7
420IF A$="GRAPH" THEN ER=2
425IF A$="CLR" THEN PROCclr:ER=FALSE
430IF A$="DIR" THEN ER=FALSE:*
435IF A$="GO" THEN ER=3
440IF A$="COMPILE" THEN PROCcomp:ER=FALSE
445IF A$="LLIST" THEN PROCllist:ER=FALSE
450IF A$="PROG" THEN PROCprog:ER=FALSE
455IF A$="LIST" THEN PROClist:ER=FALSE
460IF A$="EDIT" THEN ER=FALSE:PROCer
465IF A$="END" THEN ER=FALSE:PROCERRR("Not in prog mode.")
470IF LEFT$(A$,6)="DCHAR" THEN PROCchar:ER=FALSE
475IF LEFT$(A$,5)="SWAP" THEN PROCswap:ER=FALSE
480IF A$="CLEAR" THEN PRINT "Clear?-----(Y/N)":ER=FALSE:IF GET$="Y" THEN RUN
485IF A$="BYE" THEN PRINT "Bye?-----(Y/N)":ER=FALSE:IF GET$="Y" THEN CALL-4
490IF LEFT$(A$,4)="SAVE" THEN PROCsave:ER=FALSE
495IF LEFT$(A$,4)="LOAD" THEN PROCload:ER=FALSE
500IF LEFT$(A$,5)="FCOL " THEN ER=FALSE:PROCfc
505IF LEFT$(A$,5)="BCOL " THEN ER=FALSE:PROCbc
510IF LEFT$(A$,6)="WRITE " THEN ER=FALSE:PROCprint
515ENDPROC
520DEFPROCfc
525CZ=VAL(RIGHT$(A$,LEN(A$)-4))
530 FC=CZ
535IF CO=FALSE THEN PZ=&1100
540OPTO
545LDA#18
550JSR&FFEE
555LDA#0:JSR&FFEE
560LDA#CZ:JSR&FFEE
565LDA#17
570JSR&FFEE
575LDA#CZ
580JSR&FFEE
585J
590IF CO=FALSE THEN PROCcall
595ENDPROC
600DEFPROCbc
605CZ=VAL(RIGHT$(A$,LEN(A$)-4))
610IF CO=FALSE THEN PZ=&1100
615OPTO
620LDA#18
625JSR&FFEE
630LDA#0:JSR&FFEE
635LDA#CZ+128:JSR&FFEE
640LDA#17
645JSR&FFEE
650LDA#CZ+128
655JSR&FFEE
660J
665IF CO=FALSE THEN PROCcall
670ENDPROC
675DEFPROCclr
680IF CO=FALSE THEN PZ=&1100
685OPTO
690LDA#16
695JSR&FFEE
700LDA#12:JSR&FFEE
705J
710IF CO=FALSE THEN PROCcall
715ENDPROC
720DEFPROCswap
725IF CO=FALSE THEN PZ=&1100
730BZ=RIGHT$(A$,LEN(A$)-5)
```

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\* = any string

? = a single character

<n>, >n = a numeric string <or> n

#### EXAMPLES:

dn???<13>-delete mdvn\_???<13>

Delete from both drives all 3 letter files whose extension is a numeric string<13>.

c1\*\_doc->copy mdv1\_\*\_\*\_doc

Copy from drive 1 to drive 2 all files (not already on 2) which end in '\*\_doc'.

**£10** all inclusive

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# PROGRAM FILE

```

735Z%=FNfind(B%,"",1)
740X%=VAL(LEFT$(B%,Z%-1))
745Y%=VAL(RIGHT$(B%,LEN(B%)-Z%))
750[OPTO
755LDA#19
760JSR&FFEE
765LDA#X%:JSR&FFEE
770LDA#Y%:JSR&FFEE
775LDA#0:JSR&FFEE:JSR&FFEE:JSR&FFEE
780]
785IF CO=FALSE THEN PROCcall
790ENDPROC
795DEFPROCchar
800A%=A%+"",
805IF CO=FALSE THEN P%=&1100
810[OPTO:JMP P%+9:]
815PP%=P%
820B%=RIGHT$(A%,LEN(A%)-6)
825P%=23:P%=P%+1
830FOR F%=1 TO 9
835B%=FNfind(B%,"",1)
840P%=VAL(LEFT$(B%,B%-1))
845B%=RIGHT$(B%,LEN(B%)-B%)
850P%=P%+1:NEXT
855[OPTO
860LDX#0
865.L1
870LDA PP%,X
875JSR&FFEE
880INX
885CPX#10
890BNE L1
895]
900IF CO=FALSE THEN PROCcall
905ENDPROC
910DEFPROCprint
915B%=RIGHT$(A%,LEN(A%)-6)
920IF LEFT$(B%,1)="" AND RIGHT$(B%,1)="" THEN GOTO 930
925PROCERRR("Missing """) :ENDPROC
930C%=RIGHT$(B%,LEN(B%)-1)
935B%=LEFT$(C%,LEN(C%)-1)
940IF CO=FALSE THEN P%=&1100:PRINT"
945[OPTO:JMP P%+LEN(B%)+3:]
950 P%=P%
955P%=B%:P%=P%+LEN(B%)
960[OPTO
965LDA#5
970JSR&FFEE
975LDX#0
980.L2
985LDA PP%,X
990JSR&FFEE
995INX
1000CPX#(LEN(B%))
1005BNE L2
1010LDA#4
1015JSR&FFEE
1020]
1025IF CO=FALSE THEN PROCcall
1030ENDPROC
1035DEFPROCst
1040B%=RIGHT$(A%,LEN(A%)-1)
1045IF CO=FALSE THEN P%=&1100
1050J%=P%+(LEN(B%)+4)
1055[OPT2
1060JMP J%
1065]
1070P%=P%:P%=J%
1075PP%=B%
1080[OPTO
1085LDX#(PP MOD 256)
1090LDY#(PP DIV 256)
1095JSR&FFF7
1100]
1055IF CO=FALSE THEN PROCcall
1110ENDPROC
1115PROCERRR("OS ERROR:") :REPORT
1120PRINT"
1125PROCok:GOTO 55
1130DEFPROCprog
1135IF M%=2 THEN PRINT "MUST be in TXT mode.":ENDPROC
1140PRINT" "Frog Mode. Type "END" to Finish."
1145IF PL%=0 THEN PRINT "New program." ELSE PROClist:PL%=PL%+1
1150REPEAT
1155IF PL%=60 THEN PROCERRR("No Program space."):ENDPROC
1160PRINT"CHR#131;PL%;CHR#133;:PROCinput
1165D#(PL%)=A#
1170PL%=PL%+1
1175UNTIL A#="END"
1180A#=""
1185ENDPROC
1190DEFPROClist
1195IF PL%=0 THEN PROCERRR("No Program."):ENDPROC
1200PRINT" "User Program. ";PL%:" lines."
1205FOR F%=0 TO PL%-1
1210IF CL=1 THEN PRINT CHR#131;F%;CHR#133;D#(F%) ELSE PRINT F%+" " :P#(F%)
1215NEXT:ENDPROC
1220DEFPROCer
1225IF PL%=0 THEN PROCERRR("No Program."):ENDPROC
1230PROClist
1235PRINT CHR#130;"Edit which line? " :INPUT" "L%
1240IF L%<0 OR L%>PL% THEN PROCERRR("No such line."):GOTO 1235
1245PRINT" CHR#131;L%;CHR#133;:PROCinput:D#(L%)=A#:IF A#="END" THEN PL%=L%+1
1250A#="" :ENDPROC
1255DEFPROCexe
1260FOR F%=0 TO PL%-2
1265ER=TRUE
1270A#=D#(F%):IF CO=TRUE THEN PRINT CHR#129;A#
1275PROCcommand
1276IF P%&18E0 THEN PROCERRR("!!! MEMORY FULL. !!!"):ENDPROC
1280IF ER=TRUE THEN PROCERRR("Mistake at line "+STR$(F%)):VDU7,7:ENDPROC
1285NEXT
1290ENDPROC
1295DEFPROCsave:IF PL%=0 THEN PROCERRR("No Program."):ENDPROC
1300INPUT "FILENAME: "A#
1305X=OPENOUT(A#):PRINT#X,PL%:FOR F%=0 TO PL%-1
1310PRINT#X,D#(F%):NEXT:CLOSE#X:ENDPROC
1315DEFPROCload
1320INPUT "FILENAME: "A#
1325X=OPENIN(A#):INPUT#X,PL%:FOR F%=0 TO PL%-1
1330INPUT#X,D#(F%):NEXT:CLOSE#X:ENDPROC
1335DEFPROCexec:CO=FALSE
1340PROCexe

```



# PROGRAM FILE

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## 48k Spectrum Crib Player

by Mike Williams

This version of the classic card game pits you against a Spectrum opponent with some nasty human traits. Throughout the game you'll be subjected to a series of comments designed to put you off. These range from: 'You can't see me for the dust' to 'This is so easy.' These wisecracks certainly add to the game's enjoyment, which also doubles as a cribbage tutor. All the

rules are explained in the onscreen instructions which can be omitted from the code if you wish.

The game mechanics are simple but the play is far from easy as the Spectrum plays to win.

The code contains some user-defined graphics which are described in line 9800.

```

1 REM *****
2 CRIB PLAYER Mk 1.1
3 Written by:-
4 Mike Williams
5 1984
6 *****
7 9800
8 ***Deal the cards***
9 *****
10 i=no to fi
11 LET card=INT (RND*(LEN c$/tw))
12 h$(i:tw,on)=c$(card:tw,on); LET h$(i:tw,tw)=c$(card:tw,tw)
13 c$=c$(TO card:tw)+c$(card:tw:th TO )
14 LET card=INT (RND*(LEN c$/tw))
15 h$(i:tw,on)=c$(card:tw,on); LET h$(i:tw,tw)=c$(card:tw,tw)
16 c$=c$(TO card:tw)+c$(card:tw:th TO )
17 LET spsc=spsc+inc; PRINT AT 11,18;"Your score:";spsc
18 IF spsc>121 AND NOT mfig THEN PRINT >no;"You have won!"; PAUSE hun; INPUT
19 mfig=on
20 RETURN
21 REM *****
22 ***Increment spsc***
23 *****
24 LET spsc=spsc+inc; PRINT AT 11,18;"My score:";spsc
25 IF spsc>121 AND NOT mfig THEN PRINT >no;"I have won!"; PAUSE hun; INPUT
26 mfig=on
27 RETURN
28 REM *****
29 ***Print pip count***
30 REM *****
31 PRINT AT 11,18;"Pip count:";AT ni,14;pip;
32 RETURN
33 REM *****
34 ***Redo pip and play***
35 REM *****
36 pip=no; GO SUB 200
37 PRINT AT si,no;" ";AT si,twe;" "
38 RETURN
39 REM *****
40 ***Initialisation***
41 REM *****
42 PRINT AT fo,11;"Turn up:"
43 LET inc=no
44 GO SUB 150; GO SUB 175
45 GO SUB 250
46 REM *****
47 ***Score 4 card hand***
48 REM *****
49 LET tamo; LET tbtat; LET tc=ta; LET td=ta; LET tsc=ta; IF s$(tw)=s$(fo) AN
50 s$(tw)=s$(fo) THEN LET tsc=fo; GO TO 2035
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# MICROMART

[illegible]

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# Commodore 64 Sprite Editor

by Robert Whittaker

This useful utility allows the user to create and store up to 55 sprite patterns, which can be either created from scratch or edited at a later date.

The sprite you wish to work on is selected by entering a block number between 200 and 255; this loads the block of data into the editor frame where it can be easily created or altered.

This is simply done using the cursor keys and the 'A' key to set a pixel in the sprite pattern, and the space bar to erase a pixel previously set.

Other options available in this menu-driven program include the facility to load and save sprite data from tape, and inversion of an existing sprite to form another one.

```

POKE55,194:POKE56,49:CLR
10 DIMP$(21):POKE649,1:Y=53248:POKEV+32,0:POKEV+33,0:GOSUB1500
15 PRINT"(CLR)(RVS)(BLU)";
20 POKEV+21,0:PRINT"(RVS)(PUR)";
25 PRINT"(RVS)(BLU)";
30 PRINT"(RVO)(CUD)(CUD)LAST DATA BLOCK WORKED ON=";B;CHR$(13);"LAST LOA
SAVE BLOCK = ";B1
35 PRINT"(CUD)(RVS)(BLU)1.(GRN)(RVO)ENTER EDITOR";CHR$(13);"(RVS)(BLU)2.
(GRN)(RVO)DISPLAY LAST SPRITE";CHR$(13);
40 PRINT"(RVS)(BLU)3.(GRN)(RVO)DISPLAY ANY DATA BLOCK";CHR$(13);
"(RVS)(BLU)4.(GRN)(RVO)SEE DATA FOR ANY BLOCK";
42 PRINT CHR$(13);"(RVS)(BLU)5.(GRN)(RVO)INVERSE SPRITE";
CHR$(13);"(RVS)(BLU)6.(GRN)(RVO)ANIMATE SPRITE";
45 PRINT CHR$(13);"(RVS)(BLU)7.(GRN)(RVO)LOAD SPRITE DATA FROM TAPE";
CHR$(13);"(RVS)(BLU)8.(GRN)(RVO)";
48 PRINT"SAVE SPRITE DATA TO TAPE";CHR$(13);"(RVS)(BLU)9.(GRN)(RVO)
EXIT EDITOR"
50 PRINT:PRINT:PRINT "(PUR)PRESS APPROPRIATE KEY":GOTO227
90 :
91 :
92 :
95 PRINT"(CLR)"
100 PRINT"(GRN)BLOCK TO WORK ON?":GOSUB 270:GOSUB 300
115 B=BL:X=24:Y=74:POKEV+21,61:CHAR=-160:FG=0:POKEV,X:POKEV+1,Y
118 GOSUB 200
120 IFX>211ORX<24 THENX=PEEK(V)
125 IFY>234ORY<74 THENY=PEEK(V+1)
128 POKEV,X:POKEV+1,Y
130 IFFG=1 THENGOSUB160
133 IFFG=2 THENGOTO352
135 IFFG=3 THENGOTO15
155 GOTO18
160 XX=(X-12)/8:YY=(Y-46)/8:S=1024+XX*40*YY:POKES,CHAR:POKES+54272,2:
FG=0
165 RETURN
170 :
175 :
176 :
200 GETK$=1FK$=1"THEN200
205 1FK$=1"(CUL)"THENX=X-8:RETURN
208 1FK$=1"(CUR)"THENX=X+8:RETURN
210 1FK$=1"(CUP)"THENY=Y-8:RETURN
215 1FK$=1"(CUD)"THENY=Y+8:RETURN
218 1FK$=1"A"THENCHAR=-160:FG=1:RETURN
220 1FK$=1"(SPC)"THENCHAR=32:FG=1:RETURN
222 1FK$=1CHR$(13)THENFG=3:RETURN
225 1FK$=1"(F1)"THEN PRINT"(HOM)(BLU)(RVS)CREATE SPRITE":FG=2:RETURN
226 RETURN
227 GETK$=1FK$=1"THEN227
228 1FK$=1"1"THEN95
230 1FK$=1"2"THENFG=4:PRINT"(CLR)(GRN)BLOCK TO WORK ON?":GOSUB270:
GOSUB300
235 1FK$=1"3"THEN600
237 1FK$=1"4"THEN502
238 1FK$=1"5"THEN705
239 1FK$=1"6"THEN875
240 1FK$=1"7"THEN820
249 1FK$=1"8"THEN858
250 1FK$=1"9"THENEND
253 GOTO227
254 :
255 :
256 :
270 INPUT"(PUR)(RVS)BLOCK(RVO)";BL$:BL$=LEFT$(BL$,3):BL=VAL(BL$)
272 1FBL>255ORBL<200THEN PRINT"OUT OF RANGE";GOTO 270
275 RETURN

```



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```

276 :
277 :
278 :
280 PRINT"(GRN)O.K.FINISHED,ANY KEY RETURNS TO MENU":POKE198,0:WAIT
198,1:RETURN
290 :
291 :
292 :
300 PRINT"(CLR)(CUD)(CUD)(GRN)":FORL-OTO18:PRINTTAB(28)"(RVS)
NEXTL:PRINT"(MOM)(CUD)(CUD)(BLU)":
318 PRINT"(RVS) ":(RVS) "FORL-OTO20
320 PRINT"(RVS)(SPC)(RVO) ":(RVS)(RVO)":(CUR)
(CUR)(CUR)(CUR)(CUR)(CUR)(CUR)(CUR)(CUR)(CUR)":NEXTL
330 PRINT"(RVS) ":(RVS)(BLU)PLOT":
335 PRINT"(HOM)":(RVS)(BLU)PLOT": BLOCK":BL;
(CUL) "
338 1FFG=4THENGOTO345
340 RETURN
345 PRINT"(HOM)(CUD)(CUD)(CUD)(RED)":FORL-OTO20:PRINT"(CUR);P$(L):
NEXTL:FG-O:GOTO115
349 :
350 :
351 :
352 M-BL*64-R-O:FORL-OTO20:P$(L)-"":NEXTL:FORL-OTO62:POKEM+L,O:NEXTL
353 FORRY-OTO20:YY=1145+40*RY:RX-O
365 FORC-OTO2
368 FORN=7TOOSTEP-1:P=PEEK(YY+RX)
370 1FP=160THENPENPOKEM,(PEEK(M)+2*N)AND255:P$(R)=P$(R)+(RVS)(SPC)(RVO)"
380 1FP=32THENP$(R)=P$(R)+" "
390 RX-RX+1:NEXTN:M=M+1:NEXTC:R=R+1:NEXTRY
405 FORC-OTO3:POKE2042+C,BL:NEXTC
450 PRINT"(HOM)(CUD)":GOSUB280:GOTO15
480 :
485 :
486 :
502 PRINT"(CLR)(GRN)SEE DATA FOR WHICH BLOCK?"
505 GOSUB270:M-BL*64:PRINT"(CUD)(CUD)":FORL-MTOM+62:PRINT"(GRN)(CUR)":
PEEK(L):" ":
508 NEXTL:PRINTCHR$(20):CHR$(13):GOSUB280:GOTO15
575 :
576 :
578 :
600 PRINT"(CLR)(GRN)DISPLAY WHICH BLOCK?":GOSUB270:M-BL*64:P=PEEK(M):
POKEV+21,61:B-BL
602 FORL=2042TO2045:POKEL,BL:NEXTC:GOSUB300:FORRY-OTO20:YY=1145+40*RY:
RX-O
605 FORC-OTO2:FORN=7TOOSTEP-1
618 1FP=2*NTHENP-P-2/N:POKE54272+YY+RX,2:POKEYY+RX,160:
625 RX-RX+1:NEXTN:M=M+1:P=PEEK(M):NEXTC:NEXTRY
630 GOTO15
700 :
701 :
702 :
705 PRINT"(CLR)":(GRN)INVERSE WHICH BLOCK?":GOSUB270:M-BL*64:B-BL
710 FORL-MTOM+63:POKEL,255-PEEK(L):NEXTL
720 GOSUB280:GOTO15
800 :
802 :
805 PRINT"(CLR)":(RVS)(GRN)LOAD DATA INTO WHICH BLOCK?":GOSUB270:
M-BL*64:B1-BL
825 OPEN1,1,0,"":FORL-OTO62:INPUT#1,X:POKEM,X:M=M+1:NEXTL:CLOSE1:
GOSUB280
850 GOTO15
851 :
852 :
853 :
858 PRINT"(CLR)":(RVS)(GRN)SAVE WHICH BLOCK?":GOSUB270:M-BL*64:
B1-BL
860 OPEN1,1,1,"WHITE DATA":FORL-MTOM+63:X=PEEK(L):PRINT#1,X:NEXTL
CLOSE1:GOSUB280:GOTO15
900 :
905 :
908 :
910 POKEV+21,0:PRINT"(CLR)(GRN)TYPE IN THE BLOCK NO'S YOU WISH
TO ANIMATE"
976 PRINT"'E' STARTS/ENDS THE ANIMATION":PRINT"'SPACE' SLOWS ANIMATION"
977 FORL-OTO10:GOSUB270:AN(L)=BL
978 FORT-OTO500:NEXTT:GETK$:IFK$="E"THENP=L:GOTO880
979 NEXTL:P=10
980 INPUT"(RVS)(GRN)ENLARGE X,Y,NO,B(RVO)":OP$:OP$=LEFT$(OP$,1)
981 IFOP$="X"THENPOKEV+29,1
982 IFOP$="Y"THENPOKEV+23,1
983 IFOP$="B"THENPOKEV+23,1:POKEV+29,1
984 X=24:POKEV+1,140:R-O:POKEV+21,1
985 POKE2040,AN(R):R=R+1:1F>PTHENR-O
986 1FX>320THENPOKEV+16,0:X=24
988 POKEV+16,INT(X/256):POKEV,XAND255:X=X+2
990 GETK$:1FK$="E"THEN900
992 1FK$="" THENGOSUB895
993 FORT-OTO30:NEXTT:GOTO885
994 FORT-OTO700:NEXT:RETURN
995 POKEV+23,20:POKEV+29,24:GOSUB280:POKE2040,11:POKEV+16,60:
X=24:POKEV,X
996 GOTO15
1000 :
1001 :
1002 :
1500 POKEV+16,60:POKEV+39,4:FORL=41TO44:POKEV+L,6:NEXTL:POKEV+23,20:
POKEV+29,24
1515 POKEV+4,10:POKEV+5,70:POKEV+6,10:POKEV+7,115:POKEV+8,10:POKEV+9,140
1518 POKEV+10,10:POKEV+11,188:POKE2040,11:FORL=704TO704+63:READDPOKEL,D:
NEXTL
1530 RESTORE:RETURN
1535 DATA0,255,0,0,255,0,0,255,0,0,255,0,0,255,0,0,255,0,0,255,0,0,255,0
1540 DATA
2000 REM*****
2005 REM* *
2008 REM* NOTES ON OPERATION *
2010 REM* *
2012 REM* *
2025 REM* USE THE CURSER KEYS TO MOVE *
2028 REM* SPRITE CSR.AROUND THE *
2030 REM* SCREEN *
2035 REM* 'A'WILL PLOT A POINT AND *
2036 REM* 'SPACE'WILL ERASE A POINT. *
2040 REM* 'F' SHOULD BE PRESSED IN *
2045 REM* ORDER TO CREATE A SPRITE. *
2050 REM* 'RETURN' WILL RE-DISPLAY *
2055 REM* THE MENU. *
2057 REM* *
2060 REM*****

```



# PROGRAM FILE



## Commodore 64 Mouse Master

by Stephen Howard

This program imitates an Apple-style computer mouse. Using a joystick to move a white cross around the screen, the user can select an option or screen position by pressing the fire button, thus eliminating the need to use the keyboard; this extends the versatility of the machine. A sprite is used instead of a cursor because it can move independently of any text or graphics and is unaffected by clearing the screen. The program is intended as a subroutine for the user to put in his own programs. To create or reset the mouse a GOSUB 40000 is executed. The mouse is then initialised, but is not displayed on the screen. After this initialisation the program will return to the user's program.

The second routine is enabled by a GOSUB 50000 and the user can then move a cross around the screen using the joystick, and can input a position,

which is then returned to the user's program as screen coordinates in X1 and Y1. The user's program then interprets these as either positions in text, program options or whatever the program intended. Further GOSUB calls to 50000 will enable the user to move the mouse from its last position, and input a new position.

All the REMs in the program need not be typed. Turn off the sprite before saving the programs, as sprites can interfere with cassette operation.

By adding the line 30000 GOTO 52000 and lines from 52000 onwards, a small demonstration program is formed. This takes the form of a screen control menu, altering different attributes of the screen. After entering the time, you are given a menu from which you can choose items by moving anywhere within the surround and pressing the fire button.

```

40000 V=3248
40001 JOY=56320
40002 F=8
40010 POKE2040,192
40020 FOR T=12260 TO 12350:POKET,0:NEXT T
40025 FOR T=12360 TO 12380:STEP3
40030 POKET,24:NEXT:POKET,12323,255
40030 POKEV+39,1
40040 POKEV+21,0
40050 POKEV+1,42:POKEV,8:X=8:Y=42:
40055 RETURN
40060 :
40061 :
50000 POKEV+21,1
50005 P=15-(PEEK(JOY)AND15)
50010 IF (PAND1) THEN Y=Y-(1+P)
50020 IF (PAND2) THEN Y=Y+(1+P)
50030 IF (PAND4) THEN X=X-(1+P)
50040 IF (PAND8) THEN X=X+(1+P)
50043 IFX(8) THEN X=8
50044 IFX(32) THEN X=320
50045 IFY(42) THEN Y=42
50046 IFY(234) THEN Y=234
50050 POKEV+1,Y
50051 POKEV+16,1+(X<255)
50052 POKEV,X+(X>255)*255
50053 IF (PEEK(JOY)AND16)=0 THEN 50070
50060 GOTO50005
50070 X1=X-8:Y1=Y-42
50080 Y1=INT(Y1/8+1)
50081 X1=INT(X1/8+1)
50090 RETURN
50091 :
50092 :
52000 PRINT "J"
52090 INPUT "TIME:HH/MM/SS":T1:
52095 PRINT "J"
52100 PRINT " "
52110 PRINT " | "
52120 PRINT " | IL | "
52130 PRINT " | "
52131 PRINT " | "
52150 PRINT " |CLOCK| "
52160 PRINT " "
52190 PRINT " "
52200 PRINTTAB(7):
52210 PRINTTAB(7): " |00000000| "
52220 PRINTTAB(7): " |00000000| "
52229 PRINTTAB(7): " | "
52230 PRINTTAB(7): " |CHANGE| "
52250 PRINTTAB(7): " |BORDER| "
52260 PRINTTAB(7): " "
52290 PRINT " "
52300 PRINTTAB(15): " "
52310 PRINTTAB(15): " | "
52320 PRINTTAB(15): " | "
52329 PRINTTAB(15): " | "
52330 PRINTTAB(15): " | LIST | "
52350 PRINTTAB(15): " |PROGRAM| "
52360 PRINTTAB(15): " "
52370 :
52390 GOSUB40000
52400 GOSUB50000
52410 IFX1>8ANDX1<8ANDY1>8ANDY1<8 THEN 53000
52420 IFX1>7ANDX1<16ANDY1>7ANDY1<15 THEN 53200
52430 IFX1<15ANDX1<36ANDY1<14ANDY1<22 THEN 53400
52440 GOTO52400
52899 :
53000 PRINT " "
53001 PRINT " "
53020 PRINTMID$(T1$,1,2):" "
53030 PRINTMID$(T1$,3,2):" "
53040 PRINTMID$(T1$,5,2):" "
53050 GOTO52400
53189 :

```

```

REM START OF VIDEO CHIP
REM JOYSTICK PORT 2
REM DISTANCE IN EACH MOVE (TRY F=4)
REM SPRITE POSITION IN MEMORY
REM CLEAR SPRITE MEMORY
REM DEFINE SPRITE - CROSS SHAPE
REM FINISH DEFINING SPRITE
REM SPRITE COLOUR - WHITE
REM TURN SPRITE OFF
REM POSITION SPRITE AT HOME POSITION
REM RETURN TO USERS PROGRAM
:
REM TURN ON SPRITE
REM READ JOYSTICK
REM JOYSTICK MOVED UP ?
REM JOYSTICK MOVED DOWN ?
REM JOYSTICK MOVED LEFT ?
REM JOYSTICK MOVED RIGHT?
REM IS SPRITE OFF LEFT OF SCREEN ?
REM IS SPRITE OFF RIGHT OF SCREEN ?
REM IS SPRITE OFF TOP OF SCREEN ?
REM IS SPRITE OFF BOTTOM OF SCREEN ?
REM POKE 'Y' CO-ORDINATE
REM POKE MSB OF 'X' CO-ORDINATE
REM POKE 'X' CO-ORDINATE
REM IF FIRE PRESSED GOTO DECODE ROUTINE
REM START MOVEMENT LOOP AGAIN
REM SUBTRACT ZERO OFFSETS
REM WORK OUT 'Y' CO-ORDINATE
REM WORK OUT 'X' CO-ORDINATE
REM RETURN TO USERS PROGRAM
:
REM CLEAR SCREEN, TEXT LT.BLUE
REM INPUT THE TIME
REM HOME
REM NOW THE 'ICONS'.THESE ARE THE
REM PICTURES ON THE SCREEN WHICH YOU USE
REM TO SELECT THE OPTIONS.
REM
REM THIS ONE IS A CLOCK!
REM
REM
REM HOME, 6* CURSOR DOWN
REM
REM CTRL CYAN, SHIFT Q/W, CBM BLUE
REM RVS DIAMOND IS CBM BLUE
REM
REM
REM HOME, 13* CURSOR DOWN
REM
REM CHEQUERS ARE CBM 'E'
REM
REM
REM
REM
REM DO SETTING UP
REM GET A POSITION
REM IN CLOCK POSITION ?
REM IN BORDER CHANGE POSITION ?
REM IN LIST POSITION ?
REM NOT IN POSITION - TRY AGAIN ?
REM PRINT TIME ROUTINE
REM
REM ) POSITION CURSOR, 23* CURSOR DOWN
REM ) POSITION CURSOR, 12* CURSOR RIGHT
REM PRINT HOURS
REM PRINT MINUTES
REM PRINT SECONDS
REM FINISHED - START AGAIN
REM BORDER CHANGE ROUTINE

```

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# PROGRAM FILE

```

53200 B=B+1:IFB>15THENB=0      :REM NEXT COLOUR
53210 POKE53200,B               :REM POKE COLOUR
53220 GOTO52400                 :REM FINISHED - START AGAIN
53400 :                          :REM LIST PROGRAM ROUTINE
53401 PRINT"J"                  :REM CLEAR SPACE TO PRINT THE LIST COMMAND
53402 POKE631,ASC("L")          :REM PUT 'L' IN KEYBOARD BUFFER
53410 POKE632,ASC("I")          :REM PUT 'I' IN KEYBOARD BUFFER
53420 POKE633,ASC("S")          :REM PUT 'S' IN KEYBOARD BUFFER
53430 POKE634,ASC("T")          :REM PUT 'T' IN KEYBOARD BUFFER
53440 POKE635,13                :REM PUT 'RETURN' IN KEYBOARD BUFFER
53450 POKE198,5                 :REM TOTAL OF 5 CHARACTERS IN BUFFER
53455 POKEV+21,0                :REM TURN OFF SPRITE
53460 END                       :REM ABORT PROGRAM TO ALLOW LISTING
READY.

```



## Spectrum Battle Stations

by Robert Higgins

An arcade-type game written in Sinclair aircraft. If 10 aircraft fly past you, your Basic. You are a fighter pilot and the aerodrome will be bombed and destroyed. object is to shoot down the enemy.

```

1 REM "BATTLE STATIONS"
2 REM BY ROBERT HIGGINS
3 GO SUB 5000
4 GO SUB 4000
5 POKE 23656,0 LET y=16: LET
x=11:
6 LET dif=.2: LET num=10: LET
ax=3: LET ay=INT (RND*25)
8 LET score=0: LET hiscore=10
00: LET A$="HIGGINS": LET S$="WI
NG COMMANDER": LET ammo=100:
9 LET wave=0: LET lan=0: LET
shot=0: BORDER 1: PAPER 5: INK 0
: CLS
10 GO SUB 8000
102 PRINT AT x-1,y;" "
105 PRINT AT x,y-1;" "
110 PRINT AT x+1,y-1;" "
115 PRINT AT x,y+2;" "
120 PRINT AT x+2,y;" "
125 PRINT AT x+1,y+2;" "
130 IF INKEY$="p" AND y<29 THEN
LET y=y+1: PRINT AT x,y;" "
135 IF INKEY$="p" AND y<29 THEN
LET y=y+2: PRINT AT x,y;" "
140 IF INKEY$="o" AND y>2 THEN
LET y=y-1
145 IF INKEY$="o" AND y>2 THEN
LET y=y-2
150 IF INKEY$="z" AND x<12 THEN
LET x=x+1
155 IF INKEY$="z" AND x<12 THEN
LET x=x+2
160 IF INKEY$="q" AND x>2 THEN
LET x=x-1
165 IF INKEY$="q" AND x>2 THEN
LET x=x-2
180 PRINT AT INT ax,INT ay;" "
190 PRINT AT INT ax+1,INT ay;" "
195 INK 0
200 PRINT AT x-1,y; OVER 1;"▽"
210 PRINT AT x,y-1; OVER 1;"N"
215 PRINT AT x+1,y-1; OVER 1;"V"
220 PRINT AT x,y+2; OVER 1;"△"
225 PRINT AT x+2,y; OVER 1;"△"
230 PRINT AT x+1,y+2; OVER 1;"V"
240 IF INKEY$="m" THEN FOR n=1
TO 3: BEEP .3,-40+n: NEXT n: LET
ammo=ammo-2: IF x=INT ax AND y=
INT ay THEN GO SUB 1000
241 IF INKEY$="M" THEN FOR n=1
TO 3: BEEP .3,-40+n: NEXT n: LET
ammo=ammo-2: IF x=INT ax AND y=
INT ay THEN GO SUB 1000
242 IF ammo<=0 THEN GO TO 7000
245 LET ay=ay+INT (RND*3)-1
246 IF ay<3 THEN LET ay=ay+1
247 IF ay>27 THEN LET ay=ay-1
248 BEEP .025,-INT (RND*40)
250 LET ax=ax+dif
260 IF ax>15 THEN GO SUB 2000
300 INK 1: PRINT AT INT ax,INT
ay; OVER 1;"+"
305 PRINT AT INT ax+1,INT ay; O
VER 1;"+"
310 INK 0: PRINT AT 1,2;"SCORE:
";score: PRINT AT 0,2;"AMMO:";am

```



# PROGRAM FILE

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```

mo: PRINT AT 1,21;"PASSED:";lan:
IF ammo<=99 THEN PRINT AT 0,9;"
": IF ammo<=9 THEN PRINT AT 1,8
315 PRINT AT 0,11;"SHOTDOWN:";s
hot: PRINT AT 0,24;"WAVE:";wave+
1: PRINT AT 1,13;"HI:";hiscore
9999 GO TO 100
1000 PRINT AT x,y: OVER 1;" + ":
PRINT : OVER 1: FLASH 1;AT x,y;
INK 2; PAPER 6;"
1010 PRINT AT x+1,y: OVER 1;" + "-
: PRINT : OVER 1: FLASH 1;AT x+1
,y; PAPER 6; INK 2;"
1030 FOR n=1 TO 10: OUT 254,RND*
7+16: OUT 254,RND*7: NEXT n
1040 PRINT AT x,y;" ": PRINT AT
x+1,y;" "
1050 LET ax=3: LET ay=INT (RND*2
6)
1060 IF x<=7 THEN LET score=score
+200
1070 IF x>7 THEN LET score=score
+100
1073 LET ammo=ammo+7
1074 LET shot=shot+1: IF shot>=n
um THEN GO SUB 9000
1075 BORDER 1
1080 RETURN
2000 LET lan=lan+1
2010 IF lan>=10 THEN GO TO 7000
2015 LET ax=3: LET ay=INT (RND*2
6)
2020 RETURN
4000 REM INTRO
4001 PAPER 0: INK 7: BORDER 0: C
LS
4005 BEEP .25,10: BEEP .25,20: P
RINT AT 1,9: INVERSE 1;"BATTLE S
TATIONS!";AT 3,4;" + ";AT 4,4;" + "-
:AT 3,15;"BY";AT 5,9;"ROBERT HI
GGINS";AT 3,27;" + ";AT 4,27;" + "-
4010 PRINT AT 9,0: INVERSE 1;"SC
ENARIO:"; PRINT INVERSE 0;"YOU A
RE A FIGHTER PILOT PATRO
LLING THE SKIES ABOVE YOUR AEROD
ROME. IT IS BEING ATTACKED BY EN
EMY FIGHTER-BOMBERS. IT IS YOUR
TASK TO STOP THEM FROM FLYIN
G PAST YOU TO BOMB THE AEROD
ROME. IF TEN FLY PAST YOU, YOU W
ILL HAVE FAILED YOUR MISSI
ON!"
4012 PRINT "" PRESS ANY KEY TO
CONTINUE"
4013 IF INKEY$="" THEN GO TO 401
3
4015 POKE 23692,255: PAUSE 0: CL
S: PRINT : INVERSE 1;"CONTROLLI
NG YOUR SIGHT:"; PRINT AT 4,4;"U
SE "; INVERSE 1;"O"; INVERSE 0;"
TO MOVE LEFT ) USE"; PRINT AT 5
,23;""); PRINT AT 6,4;"USE "; IN
VERSE 1;"P"; INVERSE 0;"TO MOVE
RIGHT) SHIFT"; PRINT AT 7,23;"")
: PRINT AT 8,4;"USE "; INVERSE
1;"O"; INVERSE 0;"TO MOVE UP
) FOR +
4016 PRINT AT 9,23;""); PRINT AT
10,4;"USE "; INVERSE 1;"Z"; INV
ERSE 0;"TO MOVE DOWN ) SPEED";
PRINT AT 13,4;"USE "; INVERSE 1;
"M"; INVERSE 0;"TO FIRE GUNS";
PRINT AT 17,4;"PRESS ANY KEY TO
CONTINUE"
4017 IF INKEY$="" THEN GO TO 401
7
4020 CLS: PRINT : INVERSE 1;"AT
TACK WAVES:"; INVERSE 0: PRINT "
EACH WAVE CONSISTS OF TEN ENEMY
PLANES. EACH TIME YOU SHOOT DOWN
TEN PLANES A NEW WAVE BEGINS.
EACH WAVE IS HARDER TO SHOOT
DOWN THAN THE LAST!"
4023 PRINT : INVERSE 1;"SCORING
:"; PRINT "YOU SCORE 200 IF YOU
SHOOT A PLANE UP HIGH, BUT ON
LY 100 DOWNLOW. EACH TIME YOU SH
OOT DOWN ANATTACK WAVE YOU GET A
BONUS!"
4025 PRINT : INVERSE 1;"END OF
GAME:"; PRINT "THE GAME ENDS WH
EN TEN AIRCRAFT FLY PAST OR WHEN
ALL AMMO IS SPENT"
4030 PRINT "" PRESS ANY KEY TO
BEGIN"
4035 PAUSE 0
4040 BEEP .25,10: BEEP .25,20
4999 RETURN
5000 REM GRAPHICS
5010 DATA 0,0,0,1,1,15,0,3
5011 RESTORE 5010

```



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```

5012 FOR n=0 TO 7: READ J
5015 POKE USR "a"+n,J: NEXT n
5020 DATA 0,0,0,0,0,224,0,128
5021 RESTORE 5020
5022 FOR n=0 TO 7: READ J
5025 POKE USR "b"+n,J: NEXT n
5030 DATA 5,7,255,97,3,1,0,0
5031 RESTORE 5030
5032 FOR n=0 TO 7: READ J
5035 POKE USR "c"+n,J: NEXT n
5040 DATA 64,192,255,6,128,0,0,0
5041 RESTORE 5040
5042 FOR n=0 TO 7: READ J
5045 POKE USR "d"+n,J: NEXT n
5050 DATA 255,64,32,16,8,4,2,1
5051 RESTORE 5050
5052 FOR n=0 TO 7: READ J
5055 POKE USR "e"+n,J: NEXT n
5060 DATA 255,2,4,8,16,32,64,128
5061 RESTORE 5060
5062 FOR n=0 TO 7: READ J
5065 POKE USR "f"+n,J: NEXT n
5070 DATA 128,192,160,144,136,13
5071 RESTORE 5070
5072 FOR n=0 TO 7: READ J
5075 POKE USR "g"+n,J: NEXT n
5080 DATA 1,3,5,9,17,33,65,129
5081 RESTORE 5080
5082 FOR n=0 TO 7: READ J
5085 POKE USR "i"+n,J: NEXT n
5090 DATA 129,130,132,136,144,16
5091 RESTORE 5090
5092 FOR n=0 TO 7: READ J
5095 POKE USR "h"+n,J: NEXT n
5100 DATA 129,65,33,17,9,5,3,1
5101 RESTORE 5100
5102 FOR n=0 TO 7: READ J
5103 POKE USR "j"+n,J: NEXT n
5110 DATA 1,2,4,8,16,32,64,255
5111 RESTORE 5110
5112 FOR n=0 TO 7: READ J
5115 POKE USR "k"+n,J: NEXT n
5120 DATA 128,64,32,16,8,4,2,255
5121 RESTORE 5120
5122 FOR n=0 TO 7: READ J
5125 POKE USR "l"+n,J: NEXT n
5130 DATA 18,84,169,114,252,249,
5131 RESTORE 5130
5132 FOR n=0 TO 7: READ J
5135 POKE USR "m"+n,J: NEXT n
5200 RETURN
7000 REM END
7006 PRINT AT 0,2: INK 1;"AMMO:"
7007 PRINT AT 1,21: INK 1;"PAS
SED:";lan
7007 FOR i=1 TO 5: FOR j=20 TO 4
0 STEP 5
7008 BEEP .005,J: NEXT J
7010 FOR j=40 TO 20 STEP -5
7015 BEEP .005,J: NEXT J: NEXT i
7020 BEEP .05,-50: BEEP .05,-40:
BEEP .05,-50: BEEP .05,-40: PRI
NT AT 19,28: PAPER 6: FLASH 1: I
NK 2;"*"
7025 BEEP 0.05,-50: BEEP .05,-40
: BEEP .058,-50: BEEP .05,-40: P
RINT AT 19,4: PAPER 6: FLASH 1:
INK 2;"*"
7030 BEEP 0.05,-50: BEEP .05,-40
: BEEP .05,-50: BEEP .05,-40: PR
INT AT 19,23: PAPER 6: FLASH 1:
INK 2;"*";AT 18,23: PAPER 6: INK
2: FLASH 1;"*"
7035 BEEP 0.05,-50: BEEP .05,-40
: BEEP .05,-50: BEEP .05,-40: PR
INT AT 17,27: PAPER 6: FLASH 1:
INK 2;"*"
7040 PRINT AT x-1,y;" "
7045 PRINT AT x,y-1;" "
7050 PRINT AT x+1,y-1;" "
7055 PRINT AT x,y+2;" "
7060 PRINT AT x+2,y;" "
7065 PRINT AT x+1,y+2;" "
7070 INK 0: PRINT AT 3,2: FLASH
1;"YOU HAVE FAILED YOUR MISSION!
7075 PRINT AT 5,10:"SCORE:";scor
e
7084 IF score>=5000 OR score<700
0 THEN LET r$="WING COMMANDER"
7085 IF score=0 THEN LET r$="GRO
UND STAFF!!"
7086 IF score>0 AND score<1000 T
HEN LET r$="TRAINEE PILOT"
7087 IF score>1000 AND score<=20
00 THEN LET r$="FLT. LIEUTENANT"
7088 IF score>2000 AND score<=30
00 THEN LET r$="SERGEANT"
7089 IF score>3000 AND score<=40

```



# PROGRAM FILE

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```

00 THEN LET r$="CAPTAIN"
7090 IF score>4000 AND score<=50
00 THEN LET r$="GROUP CAPTAIN"
7091 IF score>5000 AND score<=60
00 THEN LET r$="FLIGHT OFFICER"
7092 IF score>=7000 THEN LET r$="
SQUADRON LEADER"
7093 PRINT AT 7,2;"YOUR RANK IS
";r$;
7094 IF score>hiscore THEN PRINT
AT 9,7;"NEW HIGH SCORE!"; LET s
=r$
7095 POKE 23658,8: IF score>hisc
ore THEN INPUT "INPUT YOUR SURNAM
E (MAX.10)";A$: LET hiscore=scor
e
7096 PRINT AT 11,9;"HI-SCORE ";h
iscore
7097 PRINT AT 13,3;"BY ";s$;" ";
A$;
7098 PRINT AT 15,4;"PRESS A KEY
TO PLAY AGAIN"
7099: PAUSE 0: IF INKEY$="" THEN
GO TO 7097
7100 POKE 23658,0: LET y=16: LET
x=11:
7110 LET diff=.2: LET num=10: LE
T ax=3: LET ay=INT (RND*26)
7120 LET score=0: LET ammo=100:
7130 LET wave=0: LET lan=0: LET
shot=0: BORDER 1: PAPER 5: INK 0
:CLS
7999 GO TO 10
8000 REM BACKGROUND
8010 PLOT 128,47: DRAW -37,-47:
PLOT 144,47: DRAW 37,-47
8015 PLOT 0,47: DRAW 255,0
8020 PLOT 64,0: DRAW 0,8: DRAW -
1,0: DRAW 0,-8: CIRCLE 64,10,PI:
PLOT 64,14: DRAW OVER 1;13,5: D
RAW 2,0: DRAW 0,-1: DRAW -11,-10
8025 PLOT 204,15: DRAW -16,-2,PI
: DRAW -10,14: PLOT 188,34: DRAW
-10,-8,PI: PLOT 187,34: DRAW 15
,-19: DRAW -19,-2
8030 PLOT 232,33: DRAW -16,0,PI:
DRAW 16,0: PLOT 216,33: DRAW -6
,4: PLOT 226,33: DRAW -16,-2,PI
8035 PLOT 232,12: DRAW 8,2: DRAW
1,-2: DRAW -7,-2: DRAW -2,2: PL
OT 236,13: DRAW 0,2: DRAW 1,0: D
RAW 0,-2
8040 PLOT 234,12: DRAW -10,10: D
RAW 2,2: DRAW 10,-11: PLOT 226,2
1: DRAW -8,-5: DRAW 1,-2: DRAW 9
,3
8041 PLOT 136,47: DRAW 0,-5: PLO
T 136,35: DRAW 0,-10: PLOT 136,1
5: DRAW 0,-15
8042 PLOT 42,12: DRAW -10,10: DR
AW 2,2: DRAW 10,-11: PLOT 34,21:
DRAW -8,-5: DRAW 1,-2: DRAW 9,3
8043 PLOT 42,12: DRAW -10,10: DR
AW 2,2: DRAW 10,-11: PLOT 34,21:
DRAW -8,-5: DRAW 1,-2: DRAW 9,3
8044 PLOT 40,12: DRAW 8,2: DRAW
1,-2: DRAW -7,-2: DRAW -2,2: PLO
T 44,13: DRAW 0,2: DRAW 1,0: DRA
W 0,-2
8045 PLOT 34,20: DRAW 8,4: DRAW
0,-1: DRAW -10,-6
8046 PLOT 226,20: DRAW 8,4: DRAW
0,-1: DRAW -10,-6
8047 PLOT 40,47: DRAW -40,-16: P
LOT 224,47: DRAW 31,-16
8050 PRINT AT 16,0: INK 4: OVER
1: PAPER 0;"
8098 PAPER 5: BORDER 1:
8099 RETURN
9000 REM WAVES
9001 FOR n=10 TO 40 STEP 3: BEEP
.05,n: NEXT n
9002 PRINT AT 0,11: INK 1;"SHOTD
OWN:";shot
9003 LET wave=wave+1: LET diff=d
iff+.2: LET num=num+10: LET sco
re=score+500*wave
9005 PRINT AT 5,7: INK 2: PAPER
0: FLASH 1;"WAVE ";wave;" COMPLE
TED!";
9006 PRINT INK 2: PAPER 6: AT 7,2
;"PRESS ANY KEY TO CONTINUE!"
9007 IF INKEY$="" THEN GO TO 900
7
9008 CLS
9010 GO SUB 8000
9020 RETURN

```



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Here is a guide to PCW back issues. Hardware reviews/Benchtests are indexed by manufacturer, software by product name.

## HARDWARE

| <b>A</b>                   |                               |                |
|----------------------------|-------------------------------|----------------|
| MANUFACTURER               | PRODUCT                       | ISSUE          |
| Acorn                      | Speech System                 | January 1984   |
| Acorn                      | Electron                      | October 1983   |
| Acorn                      | BBC Micro                     | January 1982   |
| Acorn                      | Teletext Adaptor              | April 1984     |
| Acorn                      | BBC Speech Chips              | April 1983     |
| ACT                        | Apricot                       | October 1983   |
| ACT                        | Sirius 1                      | February 1982  |
| Adman Electronics          | Adman Speech Synthesiser      | January 1984   |
| AGF                        | Programmable Joystick         | December 1983  |
| AMS                        | Disc Drive: 3in               | January 1984   |
| Apple                      | Lisa                          | July 1983      |
| Apple                      | III                           | May 1982       |
| Apple                      | Macintosh                     | March 1984     |
| <b>B</b>                   |                               |                |
| British Micro              | Mimi 801                      | July 1982      |
| Brother                    | EP44                          | April 1984     |
| <b>C</b>                   |                               |                |
| C/WP                       | Cortex                        | December 1983  |
| Camputers                  | Lynx                          | March 1983     |
| Canon                      | AS-100                        | December 1983  |
| Canon                      | CX-1                          | November 1982  |
| Canon                      | X-07                          | March 1984     |
| Casio                      | PB-100                        | May 1983       |
| Casio                      | fx-9000p                      | February 1983  |
| Casio                      | 602p                          | May 1982       |
| Casio                      | FP-10 Printer                 | April 1982     |
| Coleco                     | Adam                          | April 1984     |
| Commodore                  | 715                           | January 1984   |
| Commodore                  | 64                            | May 1983       |
| CompuData                  | Tulipsystem 1                 | October 1983   |
| Conchess                   | Monarch/Ambassador/ Escourter | March 1983     |
| Corvus                     | Concept                       | March 1983     |
| Currah                     | Microspeech Unit              | January 1984   |
| <b>D</b>                   |                               |                |
| Dacom Systems              | Buzzbox                       | January 1984   |
| DCP Microdevelopments      | Speech Pack                   | August 1982    |
| Digihurst                  | Microsight 1                  | October 1983   |
| Digital Equipment          | Rainbow 100                   | November 1982  |
| Dragon Data Ltd            | Dragon 32                     | August 1982    |
| <b>E</b>                   |                               |                |
| Eaca International         | Colour Genie                  | June 1983      |
| Electroni-Kit              | FX System                     | November 1983  |
| Electroplay                | My Talking Computer           | November 1983  |
| Epson                      | QX-10                         | July 1983      |
| Epson                      | HX-20                         | December 1982  |
| Epson                      | FX-80                         | July 1983      |
| Epson                      | PX-8                          | June 1984      |
| <b>F</b>                   |                               |                |
| Ferranti                   | Argus PPC                     | November 1983  |
| Fidelity                   | Prestige                      | February 1983  |
| Fortune                    | Fortune 32:16                 | August 1983    |
| Future                     | FX20                          | October 1983   |
| <b>G</b>                   |                               |                |
| Gavilan                    | Gavilan MC                    | February 1984  |
| GCE                        | Vectrex System                | August 1983    |
| GCS                        | Ferrett                       | June 1984      |
| Gemini                     | Multiboard                    | February 1982  |
| GRiD                       | Compass                       | June 1984      |
| Gulfstream                 | Hyperion                      | October 1983   |
| <b>H</b>                   |                               |                |
| Hewlett-Packard            | HP-75C                        | November 1982  |
| Hewlett-Packard            | 15C and 16C                   | September 1982 |
| <b>H</b>                   |                               |                |
| Hewlett-Packard            | HP86                          | October 1982   |
| Hewlett-Packard            | HP-125                        | April 1982     |
| Hewlett-Packard            | HP-IL                         | March 1982     |
| High Tech Electronics      | Sid 1 Colour Board            | April 1982     |
| Hitachi                    | MB16001                       | June 1983      |
| Hitachi                    | Peach                         | May 1982       |
| <b>I</b>                   |                               |                |
| IBM                        | 9000 Instrumentation Computer | March 1983     |
| IBM                        | PC Junior                     | March 1984     |
| Ikon                       | Hobbit                        | January 1984   |
| IO Research Ltd            | Pluto                         | December 1982  |
| <b>J</b>                   |                               |                |
| Jonos                      | Jonos                         | April 1984     |
| Jupiter Cantab             | Ace                           | January 1983   |
| <b>L</b>                   |                               |                |
| LSI                        | M-Four                        | April 1983     |
| <b>M</b>                   |                               |                |
| Magus Computer Systems Ltd | Add-On Graphics Board         | September 1983 |
| Mannesmann Tally           | MT160L Dot-Matrix Printer     | August 1983    |
| Mattel                     | Aquarius                      | November 1983  |
| Microwriter Ltd            | Microwriter                   | September 1982 |
| Milton Bradley             | Phantom                       | July 1983      |
| Monroe                     | Monroe 8820                   | April 1982     |
| Motorola                   | MC68000                       | December 1982  |
| Multitech                  | Micro-Professor II            | September 1983 |
| <b>N</b>                   |                               |                |
| NCR                        | Decision Mate V               | August 1983    |
| NEC                        | PC-8201A                      | December 1983  |
| NEC                        | APC                           | September 1983 |
| Notting Dale Itec          | G007 Graphics Module          | March 1983     |
| Novag                      | Constellation                 | October 1983   |
| <b>O</b>                   |                               |                |
| Olivetti                   | M20                           | September 1982 |
| Oric Products              | Oric                          | April 1983     |
| Osborne                    | Executive                     | July 1983      |
| <b>P</b>                   |                               |                |
| Positron                   | 9000                          | October 1982   |
| <b>R</b>                   |                               |                |
| Robocom Ltd                | BitStik                       | November 1982  |
| <b>S</b>                   |                               |                |
| Sage                       | II                            | February 1983  |
| Scisys                     | Chess Champion Mark 5         | January 1983   |
| Semi-Tech                  | Pied Piper                    | September 1983 |
| Sharp                      | MZ-700                        | February 1984  |
| Sharp                      | PC1251                        | February 1983  |
| Sharp                      | PC1500                        | June 1982      |
| Sharp                      | MZ-80A                        | June 1982      |
| Sharp                      | MZ-80A                        | April 1984     |
| Shelton Instruments        | Sig/Net                       | April 1983     |
| Sinclair                   | Microdrive                    | October 1983   |
| Sinclair                   | ZX Spectrum                   | June 1982      |
| Sinclair                   | ZX81 Printer                  | January 1982   |
| SMT                        | Goupil-3                      | December 1983  |
| Sord                       | M5                            | August 1983    |
| Sord                       | Exleigh Expert                | August 1982    |
| Spectravideo               | SV-318 and SV-328             | March 1984     |
| <b>T</b>                   |                               |                |
| Tandata                    | Homedeck                      | April 1984     |



| T                 |                 |
|-------------------|-----------------|
| Tandy             | MC-10           |
| Tandy             | Model 100       |
| Texas Instruments | TI Professional |
| Texas Instruments | TI-88           |
| Texas Instruments | TI-99/4A        |
| Texas Instruments | TI-59           |
| Torch Computers   | Torch           |
| Tradecom          | Newbrain AD     |
| Tycom             | Microframe      |

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| November 1983 |
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| May 1983      |
| July 1982     |
| March 1982    |
| January 1983  |
| January 1983  |
| July 1982     |
| January 1984  |

| W X                    |                  |
|------------------------|------------------|
| Walters Microsystems   | 120 Printer      |
| Watanabe               | Personal Plotter |
| Wave Mate              | Bullet           |
| William Stuart Systems | Chatterbox       |
| Wren Computers         | Wren             |
| Xerox                  | 16/8             |
| Xerox                  | 820              |

|               |
|---------------|
| December 1982 |
| February 1982 |
| February 1984 |
| January 1984  |
| April 1984    |
| February 1984 |
| January 1982  |

## SOFTWARE

### PROGRAM

1-2-3  
1-2-3  
1982 Database Roundup  
1983 Database Roundup  
1983 Spreadsheet  
Roundup

Accountancy Programs  
(General)  
Aquila

Benchmarks Explained  
(Reference Article)

Beta  
Brainstorm  
Busifile  
Busipost

Cardbox  
Color Scarfman  
Condor Database

Databases (Choosing One)  
Dataplan  
Dataprism  
DBMS2  
Delta  
Desq  
DMS  
Dragon Disks

E40  
Ecalc  
Everyman  
Expert-Ease

Falc  
Financial Director  
FMS80  
Freqout

Homeword  
HP41-C Text Editor  
Home Accounts/Finance  
Manager

### ISSUE

April 1984  
November 1983  
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Petspeed  
Plannercall  
Prophet II

Rescue  
Revelation

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Scred  
Scripsit 2.0  
Search and Find  
Select  
Silicon Office  
System Builder  
Software Various  
Superdeflex  
Superfile

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View  
Visi On  
Visi Calc  
Visuall  
Vu-Calc (for Spectrum)

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dBase II

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August 1983

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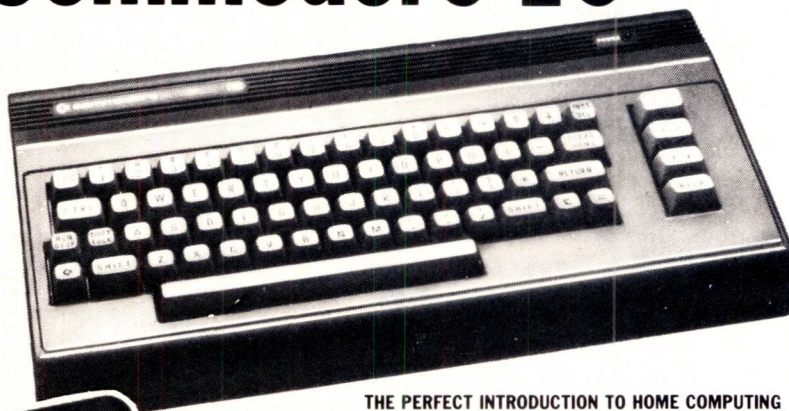
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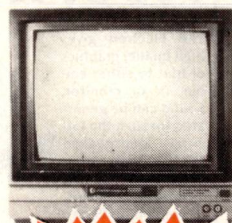
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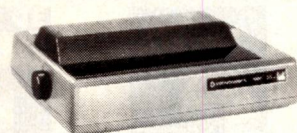


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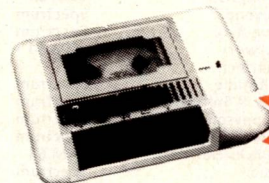
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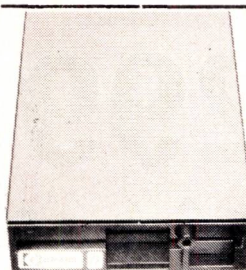
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ARRIVING SOON!



**32-bit power . . . 128K RAM . . . business software . . . it's the amazing QL!**

The QL is a ready-to-go small business /office system, with a 32-bit 68008 microprocessor for rapid data processing and a huge 128K of RAM memory - twice as much as any other micro at the price, and expandable to 640K. Then there's the 2 built-in Microdrives, a full keyboard and 3 'bundled' business programs - Archive (database), Abacus (spreadsheet) and 'Easel' (business graphics). With the 'Quill' program, it becomes a wordprocessor. Its Basic is superior to Spectrum Basic; graphics resolution is high at 512 x 256 with a multiple-screen window facility, and there's multi-tasking capability. In short, a superb machine - at an incredible price!

**SPECTRUM PRICE**

**£399**

## ARRIVING SOON! Sinclair Flat-Screen TV

**SPECTRUM PRICE**

**£99<sup>95</sup>**



Here it is - the incredible new TV that's a revolution in technology . . . available from Spectrum NOW! The amazing Flat-Screen TV has a picture that's 3 times brighter AND half the bulk of an ordinary screen of the same size - yet it uses between 1/4 and 1/10 the power! The new front-coated phosphor screen gives a pin-sharp image despite its pocketable size. The set uses just one tiny Lithium battery for long life and comes with a pouch case and earphone.

## DK'Tronics Keyboard

D'K'tronics Lightpen . . . £19.95  
D'K'tronics Dualport Joystick Interface . . . £13.00

D'K'tronics Programmable Joystick Interface . . . £22.95

**SPECTRUM PRICE**

**£45**



Plus! FREE 4 GAMES CASSETTE

# Sensational Sinclair Offer

**ZX Spectrum 48K**



Including

**FREE!**

**Software 6 pack**

Containing: • Computer Scrabble  
• Computer Chess • Survival game  
• Chequered Flag game • Horace goes Skiing game • Make-a-Chip

**Worth £56.70**

**SPECTRUM PRICE**

**£129<sup>95</sup>**

## Prism VTX5000 Modem



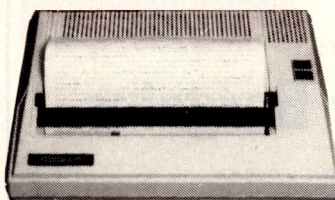
**£79<sup>95</sup>**

• Versatile modem for ZX Spectrum (16K or 48K) versions • Slim design fits easily, matches your micro • Instant access to Prestel™ & Micronet 800 information services • Instant communication with other ZX Spectrum users.

## Alphacom 32 Printer

**SPECTRUM PRICE**

**£79<sup>95</sup>**



ALPHACOM 42 For Dragon, BBC, Commodore, Atari (Interfaces extra)  
SPECTRUM PRICE . . . . . £79.95

Paper Rolls for Alphacom Printers  
Box of 5 Rolls . . . . . £6.00

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

## Computer Dealers

or prospective dealers. If you would like to know more about becoming a SPECTRUM APPOINTED DEALER on an exclusive area basis please write to: Bob Cleaver  
Spectrum Group PLC, Hunting Gate,  
Hitchin, Herts SG4 0TJ Tel (0462) 37171

## More from Spectrum...



# spectrum

## Juki 6100

**Super Value!**

**Daisy Wheel Printer**



This fabulous new printer is a real breakthrough in the performance/value stakes! For a remarkably low price you get all these great features:

- Daisywheel printing • 20cps (av. 18cps Shannon Text) • 10/12/15 or Proportional character spacing • Bi-directional friction-feed • Tractor feed or cut paper • Centronics as standard; RS232C optional • 2K byte print buffer

**£399**

## Sensational Printer Offers from Spectrum

### Quendata

Just look at this for value - a true daisy-wheel printer offering top quality printing at a remarkably low price. Print speed is 18/20cps, uni-or bi-directional printing (depends on software), variable pitch.



Tractorfeed optional extra

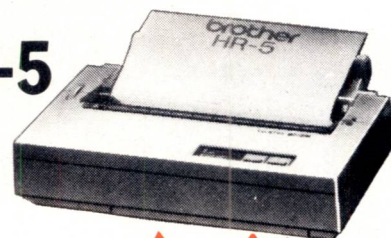
SPECTRUM PRICE

**£289<sup>95</sup>**

## Other Printer Bargains

|                |         |                          |         |
|----------------|---------|--------------------------|---------|
| SEIKOSHA       |         | GP100VC VIC 20/64        | £199.95 |
| GP50A          | £99.95  | Friction Feed GP100/250X | £28.75  |
| GP50S Spectrum | £99.95  | EPSON                    |         |
| GP500A         | £179.95 | FX80                     | £503.70 |
| GP550A         | £229.00 | RX80T                    | £286.35 |
| GP100A MkII    | £199.95 | RX80FT                   | £327.75 |

## Brother HR-5



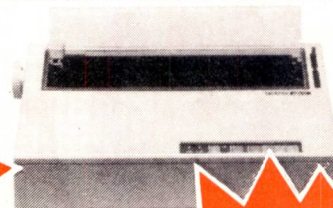
Super value printer that prints on plain paper, yet still fits in your briefcase.

- Operates on 4 standard batteries
- Incorporates Centronics or RS232C
- Bidirectional or unidirectional
- High quality Thermal head
- Prints at 30cps on plain paper (with ribbon) or directly onto thermal paper
- Weighs under 2kg

SPECTRUM PRICE

**£159<sup>95</sup>**

## Brother HR-15



A great printer at a top-value price from Spectrum. Here's what you get:

- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

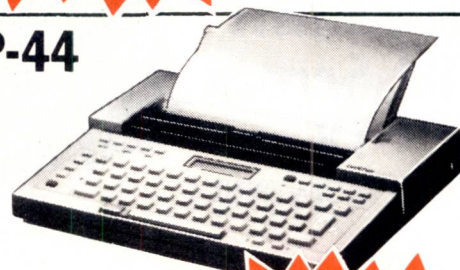
SPECTRUM PRICE

**£458<sup>85</sup>**

## Brother EP-44

"Transforming Office Machines", runs Brother's slogan - with these super-compact battery powered typewriters, it's easy to see why!

- Top quality thermal printing head
- 4K of text memory (3 A4 pages)
- Text centring if required
- 15-digit LCD display for pre-printing corrections
- Line-by-line edit facility



SPECTRUM PRICE

**£249<sup>95</sup>**

## Smith-Corona D100

This superb dot matrix printer from Smith-Corona is a sleek, well-made machine that'll work with either tractor- or friction-fed paper. It offers a fast 120cps print speed, with 80 characters per line and a choice of well-defined typesyles. The D-100 incorporates a Centronics parallel interface.

Also available  
**Fastex 80**  
**£225<sup>17</sup>**

SPECTRUM PRICE



**£286<sup>35</sup>**

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE



252 PCW

**Up to £1000  
Instant Credit**

• There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details (UK mainland only) Typical APR -29.8%

## Latest News

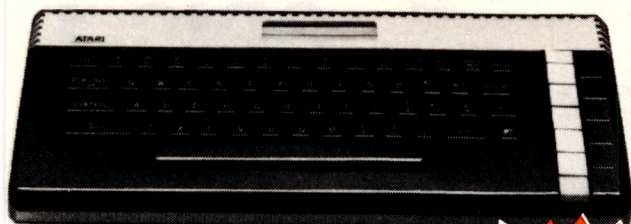
for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details



# Atari

A great line up from one of the first names in home computing...  
...Now at Super New Low prices from Spectrum

## Atari 800XL



• Powerful 64K RAM • Full-stroke keyboard • Full sound with 3½ octave range • 11 Graphic Display modes • Full colour (256 Colours - 128 colours can be displayed at one time) Ask to see this super new micro at your local SPECTRUM dealer NOW!

SPECTRUM  
PRICE

£199<sup>99</sup>

## Atari 850 Interface



SPECTRUM  
PRICE

£99<sup>99</sup>

Essential for more advanced work with their Atari computers. It provides 1 parallel output for a huge range of printers, and no less than 4 serial outputs which can be individually programmed for different purposes. It comes with a comprehensive manual, power pack & interconnecting cable to the computer.

## Atari 1027 Letter Quality Printer

This superb Letter Quality Printer prints fully-formed letters just like a quality electric typewriter, making it the ideal word-processing companion for business correspondence. The Atari 1027 accepts single sheets of paper so you can even use your own letterhead paper.



SPECTRUM  
PRICE

£249<sup>99</sup>

## Atari 600XL



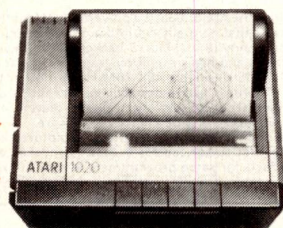
The 600XL features a 16K RAM, expandable to 64K with the memory expansion module. There's a 24K ROM operating system including ATARI BASIC. Plus 16 colours, 11 graphic modes and 4 independent 3½-octave sound synthesizers. It really is a top-value micro - come in and see for yourself!

SPECTRUM  
PRICE

£99<sup>99</sup>

## Atari 1020 Printer/Plotter

Using 4 colour graphics and text, the 1020 colour printer/plotter is perfect for creating charts, graphs & even artistic designs. Very quiet operation.



SPECTRUM  
PRICE

£99<sup>99</sup>

## Atari 1010 Program Recorder

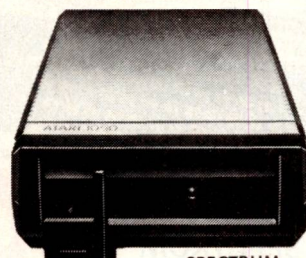


Add storage and retrieval capability to your Computer system without spending a lot of money. Uses cassettes to store text, programs & other information.

SPECTRUM  
PRICE

£34<sup>99</sup>

## Atari 1050 Disk Drive



Add the Atari 1050 Disk Drive for fast, convenient data access by storing on compact, easy-to-handle 5¼" disks. Storage capacity with DOS 11 up to 127K bytes, (around 100 pages) of information per disk.

SPECTRUM  
PRICE

£199<sup>99</sup>

## Atari Software

|                 |                                 |        |                                    |        |                                    |        |
|-----------------|---------------------------------|--------|------------------------------------|--------|------------------------------------|--------|
| Entertainment   | Tennis                          | £9.99  | (Cassette)                         | £22.99 | Macro Assembler (Disk)             | £19.99 |
| Asteroids       | Defender                        | £14.99 | Invitation to Prog 3 (Cassette)    | £24.99 | Micro Soft Basic & Manuals (Disk)  | £49.99 |
| Basketball      | Dig Dug                         | £14.99 | Juggles Rainbow (Disk or Cassette) | £19.99 | Mickey & the Great Outdoors (Disk) | £24.99 |
| Caverns of Mars | Donkey Kong                     | £14.99 | Juggles House (Disk or Cassette)   | £19.99 | My First Alphabet (Disk)           | £19.99 |
| Centipede       | Donkey Kong JR                  | £14.99 | Touch Typing                       | £12.99 | Paint (Disk)                       | £29.99 |
| Chess           | Joust                           | £14.99 | Conversational French (Cassette)   | £22.99 | Microsoft Basic II & Manuals       | £49.99 |
| Galaxian        | Ms pac Man                      | £14.99 | Conversational German (Cassette)   | £22.99 | Home Business                      |        |
| Jungle Hunt     | Pole Position                   | £14.99 | Conversational Spanish (Cassette)  | £22.99 | Atari Writer                       | £39.99 |
| Pac Man         | Robotron                        | £14.99 | Conversational Italian (Cassette)  | £22.99 | Visicalc (Disk)                    | £49.99 |
| Lone Raider     | Logo & Manuals                  | £59.99 |                                    |        | Timewise (Disk)                    | £19.99 |
| Missile Command | Video Easel                     | £22.99 |                                    |        | And many more                      |        |
| Pengo           | Music Composer                  | £22.99 |                                    |        |                                    |        |
| Qix             | Assembler Editor                | £22.99 |                                    |        |                                    |        |
| Space Invaders  | Invitation to Prog 1 (Cassette) | £19.99 |                                    |        |                                    |        |
| Star Raiders    | Invitation to Prog 2            | £22.99 |                                    |        |                                    |        |
| Super Breakout  |                                 |        |                                    |        |                                    |        |

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## More from Spectrum...



# spectrum

## Oric Atmos



The Oric Atmos boasts a powerful ROM for those demanding tasks that normally cut into a micro's memory - like colour capability (8 graphics, 8 background), powerful sound synthesis and high-resolution graphics. This keeps most of the ATMOS's valuable 48K RAM free for other tasks.

There's a typewriter-style keyboard, it's directly compatible with most domestic cassette players, a built-in RS232, and there's a wide choice of software.

• Full-featured keyboard with sculptured keys • Separate keys for cursor control • Built-in speaker • Special sound effects for game programmers • Lots of exciting programs available • Built-in centronics printer interface

SPECTRUM PRICE

Check with your local dealer for our super low price!

**Warehouse Clearance!**  
Sensational value for money



**ORIC-1  
16K**

Sensational Spectrum Price

SAVE  
**£44** Previous Price  
£99.95

**£55.95**

## Spectravideo 328



SPECTRUM PRICE

**£199.95**

- 80K RAM - expandable to 144K
- 32K ROM - expandable to 96K
- Full 87-key word-processor type keyboard
- 16 colour graphics 3-channel sound
- CP/M compatible

## Disc Drives

|                      |         |
|----------------------|---------|
| Commodore 1542.....  | £229.00 |
| Cumana CSX 100 ..... | £129.95 |
| Cumana CS100 .....   | £159.95 |
| Cumana CD800S .....  | £419.95 |
| Opus 5401 .....      | £149.95 |
| Opus 5802 .....      | £199.95 |
| Opus 3402 3" .....   | £229.95 |

## Memotech MTX512



16 User definable Function Keys • 12 Key Numeric Pad • Z80A at 4MHz • 24K ROM containing MTX BASIC • MTX NODDY FRONT PANEL DISPLAY • ASSEMBLER/DISASSEMBLER Video Display Processor with 16K video-RAM • 64K User RAM Twin RS232 Communications Board ROM Expansions: Node Systems • MTX PASCAL • MTX FORTH Eight User Definable Virtual Screens • Up to 32 SPRITES

SPECTRUM PRICE

**£275**

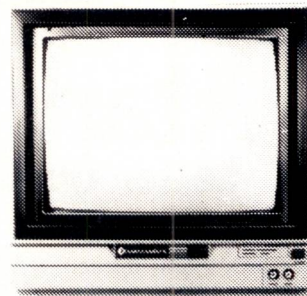
## Quickshot MkII Joystick



SPECTRUM PRICE

**£11.95**

## Monitors



|                       |         |
|-----------------------|---------|
| Commodore 1701 ...    | £230.00 |
| Sanyo 12" Green ..... | £90.85  |
| Fidelity CM14 .....   | £199.95 |
| Sanyo CDD 3125NB      |         |
| Colour .....          | £228.85 |
| Sanyo 14" Colour      |         |
| TV .....              | £199.95 |
| Microvitec Cub. ....  | £228.85 |

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE



**Up to £1000  
Instant Credit**

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## Latest News

for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details



# There's a Spectrum near you...

## AVON

**BATH** Software Plus, 12 York St  
Tel: (0225) 61676  
**CLEVEDON** Computer & Audio Centre, 12A  
Old St. Tel: (0272) 879514  
**WESTON-S-MARE** K & K Computers,  
32 Alired St Tel: (0934)419324

## BEDFORDSHIRE

**DUNSTABLE** Dormans 7-11 Broad Walk  
Tel: (0582) 65515  
**LEIGHTON BUZZARD** The Computer Ctr  
at Milton Keynes Music, 17 Bridge St.  
Tel: (0525)376622  
**LUTON** Terry-More, 49 George St.  
Tel: (0582) 23391/2

## BERKSHIRE

**BRACKNELL** Computer Centre, 44 The  
Broadway. Tel: (0344) 427317  
**SLUGH** MU Games and Computers 245  
High St. Tel: (0753) 21594

## BUCKINGHAMSHIRE

**BLETCHLEY** Rams Computer Centre,  
117 Queensway. Tel: (0908) 647744  
**CHESHAM** Reed Photography & Com-  
puters, 113 High St. Tel: (0494) 783373

## CAMBRIDGESHIRE

**CAMBRIDGE** K P Computers Ltd. 19/20  
Market St. Tel: (0223) 312240  
(Open 6 Days)  
**HUNTINGDON** T.S.C. Electronics, 3 All  
Saints Passage, High St. Tel: (0480)  
411579  
**PETERBOROUGH** Pitrbrgh Communications,  
91 Midland Rd. (0733) 41007

## CHANNEL ISLANDS

**GUERNSEY** Gruts, 3-5 The Pollett,  
St Peter Port. Tel: (0481) 24682  
**JERSEY** Audio & Computer Centre,  
7 Peter St, St Helier. Tel: (0534) 74000

## CHESHIRE

**ALTRINCHAM** Mr Micro 28 High St.  
Tel: (061) 941 6213  
**CREWE** Microman Unit 2,  
128 Nantwich Rd. Tel: (0270) 216014  
**ELLESMERE PORT** RFR Computers, 1  
Pooltown Rd. Whitty. Tel: 051 356 4150  
**MACCLESFIELD** Camera & Computer Cen-  
tre 118 Mill St. Tel: (0625) 27468  
**STOCKPORT** Wilding Ltd.  
1 Little Underbank Tel: (061) 480 3435  
**WARRINGTON** Wildings, 111 Bridge St.  
Tel: (0925) 38290  
**WIDNES** Computer City, 78 Victoria Road.  
Tel: (051) 420 3333  
**WILMSLOW** Swift of Wilmslow, 4-6 St.  
Annes Parade. Tel: (0625) 526213

## CLEVELAND

**MIDDLESBOROUGH** McKenna & Brown,  
206 Linthorpe Rd. Tel: (0642) 222368

## CORNWALL

**ST AUSTELL** A B & C Computers, Duchy  
House, 6 Lower Aylmer Sq.  
Tel: (0726) 67337  
**TRURO** Truro Micro Ltd., Unit 1, Bridge Ho,  
New Bridge St. Tel: (0872) 40043

## CUMBRIA

**BARROW-IN-FURNESS** Barrow Computer  
Centre, 2/4 The Mall. Tel: (0229) 38353  
**CARLISLE** The Computer Shop, 56-58  
Lowther St. Tel: (0228) 27710  
**PENRITH** Penrith Communications,  
14 Castlegate. Tel: (0768) 67146  
Open Mon-Fri till 8pm  
**WHITENAVEN** P D Hendren 15 King St.  
Tel: (0946) 2063

## DERBYSHIRE

**ALFRETON** Gordon Harwood 69-71 High  
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**CHESTERFIELD** The Computer Centre,  
14 Stephenson Place Tel: (0246) 208802

## DEVON

**EXETER** Seven Counties (Computers) Ltd., 7  
Paris Street. Tel: (0392) 211212  
**EXMOUTH** Open Channel, 30 The Strand.  
Tel: (0395) 264408  
**PLYMOUTH** Syntax Ltd., 76 Cornwall  
St. Tel: (0752) 28705  
**TIVERTON** Actron Micro Computers,  
37 Bampton St. Tel: (0884) 252854  
**TORQUAY** Devon Computers, 8 Torhill Rd.,  
Castle Circus. Tel: (0803) 526303

## DORSET

**BOURNEMOUTH** Lansdowne Computer Ctr  
1 Lansdowne Crescent. Tel: (0202) 20165

## DURHAM

**DARLINGTON** McKenna & Brown,  
102 Bondgate. Tel: (0325) 459744

## ESSEX

**BASILDON** Godfrey's 28-32 East Walk,  
Tel: (0268) 289379  
**BASILDON** Godfrey's Computer Centre, 5  
Laindon Main Centre Laindon. Tel: (0268)  
416747  
**CHELMSFORD** Maxton Hayman Ltd.,  
5 Broomfield Rd. Tel: (0245) 354595  
**COLCHESTER** Brainwave 51 Head St. Tel:  
(0206) 561513  
**GRAYS** H Reynolds, 79 Orsett Rd.  
Tel: (0375) 5948  
**ILFORD** Woolfmans, 76 Ilford Lane.  
Tel: (01) 478 1307  
**SOUTHEND** Computer Centre 332 London  
Rd. Tel: (0702) 337161

## HAMPSHIRE

**BASINGSTOKE** Fisher's, 2-3 Market  
Place. Tel: (0256) 22079  
**PORTSMOUTH (Waterloo)** G B  
Microland, London Rd., (Opp. Co-op)  
Tel: (07014) 59911  
**SOUTHAMPTON** RJ Parker & Son Ltd.,  
11 West End Rd, Bitterne.  
Tel: (0703) 445926  
**SOUTHAMPTON** L.T.C. Ltd., 112 East St,  
Tel: (0703) 333958/24703  
**WINCHESTER** Winchester Camera &  
Computer Centre, 75 Parchment St.  
Tel: (0962) 53982

## HEREFORD

**HEREFORD** Melgray Hi-Tech Ltd.,  
49 Broad St. Tel: (0432) 275737

## HERTFORDSHIRE

**HITCHIN** GK Photographic & Computers,  
68A Hermitage Rd., Tel: (0462) 59285  
**POTTERS BAR** The Computer Shop,  
197 High St. Tel: (0707) 44417  
**ST ALBANS (Herts)** Clarks Computer  
Centre 14-16 Hollywood Hill.  
Tel: (0727) 52991  
**STEVENAGE** D J Computers, 11 Town  
Square. Tel: (0438) 65501  
**WATFORD** SRS Microsystems Ltd., 94 The  
Parade, High St. Tel: (0923) 26602  
**WELWYN GARDEN CITY** D J Computers, 40  
Fretherne Rd, Tel: (07073) 28435/28444

## HUMBERSIDE

**BEVERLEY** Computing World, 10 Swaby's  
Yard Dyer Lane. Tel: (0482) 881831  
**GRIMSBY** RC Johnson Ltd., 22 Friargate,  
Riverhead Centre. Tel: (0472) 42031  
**HULL** The Computer Centre,  
26 Anlaby Rd. Tel: (0482) 26297

## ISLE OF MAN

**DOUGLAS** T H Colebourn Ltd.,  
57-61 Victoria St. Tel: (0624) 3482

## ISLE OF WIGHT

**COWES** Beken & Son, 15 Bath Rd. Tel:  
(0983) 297181

## KENT

**BECKENHAM** Supa Computers Ltd., 425  
Croydon Rd., Tel: (01) 650 3569  
**BROADSTAIRS** Video Vision 19/20 Willow  
Court, St. Peters Park Road Tel: (0843)  
63284 (No Early Closing Day)  
**BROMLEY** Computers Today 31 Market  
Square Tel: (01) 290 5652  
**CANTERBURY** Ctbury Computer Centre 56/  
57 Palace St. Tel: (0227) 62101  
**DOVER** Kent Photos & Computers, 4 King St.  
Tel: (0304) 202020  
**GRAVESEND** Marshalls Computers &  
Cameras, 3 Windmill St. Tel: (0474) 65930  
**RAINHAM** Microway Computers Ltd., 39  
High St. Medway Towns.  
Tel: (0634) 376702  
**SEVENOAKS** Ernest Fielder Computers,  
Dorset St. Tel: (0732) 456800  
**SITTINGBOURNE** Computers Plus, 65 High  
St. Tel: (0795) 25677  
**TUNBRIDGE WELLS** Modata Computers  
Ltd. 28-30 St Johns Rd. Tel: (0892)  
41555

## LANCASHIRE

**ACCINGTON** PV Computers,  
104 Abbey St. Tel: (0254) 36521/32611  
**BLACKBURN** Tempo Computers, 9 Railway  
Rd. Tel: (0254) 691333  
**BURNLEY** IMO Computer Centre, 39/43  
Standish St BB11 1AP Tel: (0282) 54299  
**PRESTON** Wilding's, 49 Fishergate.  
Tel: (0772) 556250

## LEICESTERSHIRE

**MARKET HARBOURGH** Harborough Home  
Computers, 7 Church St.  
Tel: (0858) 63056

## LINCOLNSHIRE

**LINCOLN** MKD Computers, 24 Newlands,  
Tel: (0522) 25907

## LONDON

**E6** Percivals, 85 High St. North, East Ham.  
Tel: (01) 472 8941  
**E17** Erol Computers Ltd., 125 High Street  
Walthamstow Tel: (01) 520 7763  
**EC1** Pedro Computer Services Ltd., 47  
Clerkenwell Road Tel: (01) 251 8635  
**EC2** Devon Computer Centre, 155 Moorgate  
Tel: (01) 638 3339/1830  
**N14** Logic Sales, 19 Broadway, The Bourne,  
Southgate. Tel: (01) 882 4942  
**N20** Castlehurst Ltd. 1291 High Rd.  
Tel: (01) 446 2280  
**NW4** Da Vinci Computer Store, 112 Brent  
St., Hendon Tel: (01) 202 2272  
**SE1** Vic Odden's 6 London Bridge Walk.  
Tel: (01) 403 1988  
**SE9** Square-Deal, 373-375 Footscray Rd.,  
New Eltham. Tel: (01) 859 1516  
**SE15** Castlehurst Ltd., 152 Rye Lane,  
Peckham. Tel: (01) 639 2205  
**SW5** CLM/Matmos 264 Earis Court Tel: (01)  
373 458/6333  
**SW16** Buffer Micro Shop, 310 Streatham  
High Rd. Tel: (01) 769 2887  
**W1** Computers of Wigmore St., 87 Wigmore  
St. Tel: (01) 486 0373  
**W1** Sonic Foto & Micro Centre, 256  
Tottenham Court Rd. Tel: (01) 580 5826  
**W7** TK Electronics, 11/13 Boston Rd.,  
Hanwell. Tel: (01) 579 2842

## GREATER MANCHESTER

**BOLTON** Wilding Ltd., 23 Deansgate.  
Tel: (0204) 33512  
**MANCHESTER** Lomax Ltd., 8 Exchange St.  
St. Ann's Square. Tel: (061) 832 6167  
**OLDHAM** Home & Business Computers Ltd.,  
54 Yorkshire St. Tel: (061) 6331608  
**ROCKDALE** Home & Business Computers,  
75 Yorkshire St. Tel: (0706) 344654  
**SWINTON** Mr Micro Ltd., 69 Partington  
Lane. Tel: (061) 728 2282  
Late Night Friday  
**WIGAN** Wilding Ltd., 11 Mesnes St.  
Tel: (0942) 44382

## MERSEYSIDE

**BIRKENHEAD** Fairs Cameras & Hi-Fi, Uacre  
Dill, Rock Ferry. Tel: (051) 645 5000

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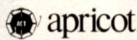
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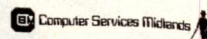
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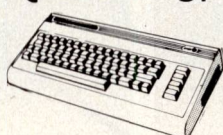
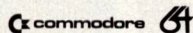
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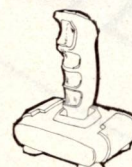
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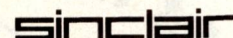
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| Full PC printer compatibility           | ✓                   | ×               | ×           |
| MTBF (hrs)                              | 6500                | 2500            | 4000        |
| Parallel interface                      | ✓                   | ✓               | ✓           |
| Noise level (dBA)                       | 59                  | 64              | 65          |
| Single sheet inserter                   | ✓                   | ✓               | ×           |
| Added hidden extras                     | ×                   | ✓               | ✓           |
| Speed draft<br>- correspondence quality | 150<br>50           | 200<br>65       | 160<br>60   |
| RRP                                     | £675                | £1,100          | £675        |

## THE HONEYWELL L321 COMPARED TO ITS NEAREST EQUIVALENTS

The L321 is a high duty cycle printer with a printhead life of 500 million characters, capable of printing 1 original plus 4 copies.

|                               | Honeywell<br>L321 | Epson<br>FX100 | OKI<br>ML83 |
|-------------------------------|-------------------|----------------|-------------|
| Full PC printer compatibility | ✓                 | ×              | ×           |
| MTBF (hrs)                    | 6500              | 2500           | 4000        |
| Parallel interface            | ✓                 | ✓              | ✓           |
| Noise level (dBA)             | 59                | 64             | 65          |
| Added hidden extras           | ×                 | ✓              | ✓           |
| Speed draft                   | 150               | 160            | 120         |
| RRP                           | £535              | £569           | £489        |

## THE HONEYWELL L121CQ COMPARED TO ITS NEAREST EQUIVALENTS.

The L121CQ is an 80 column, dual mode printer offering cut sheet feeding, IBM PC printer compatible (character set 1 & 2), incl. IBM line graphics, IBM mosaics, 3 grey tones and math. character set plus Bit image graphics.

|                                         | Honeywell<br>L121CQ | Epson<br>FX80 | OKI<br>ML92 |
|-----------------------------------------|---------------------|---------------|-------------|
| Full PC printer compatibility           | ✓                   | ×             | ×           |
| MTBF (hrs)                              | 6500                | 2500          | 4000        |
| Parallel interface                      | ✓                   | ✓             | ✓           |
| Noise level (dBA)                       | 58                  | 64            | 65          |
| Single sheet inserter                   | ✓                   | ×             | ×           |
| Added hidden extras                     | ×                   | ✓             | ✓           |
| Speed draft<br>- correspondence quality | 150<br>50           | 160<br>×      | 160<br>60   |
| RRP                                     | £449                | £438          | £449        |

## THE HONEYWELL L111 COMPARED TO ITS NEAREST EQUIVALENTS.

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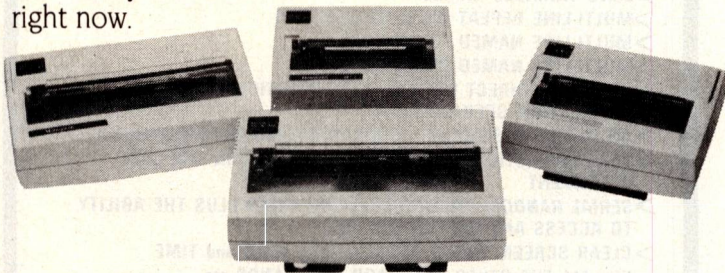
|                               | Honeywell<br>L111 | Epson<br>RX80FT | OKI<br>ML82A |
|-------------------------------|-------------------|-----------------|--------------|
| Full PC printer compatibility | ✓                 | ×               | ×            |
| MTBF (hrs)                    | 6500              | 2500            | 4000         |
| Parallel interface            | ✓                 | ✓               | ✓            |
| Noise level (dBA)             | 58                | 64              | 65           |
| Single sheet inserter         | ✓                 | ×               | ×            |
| Added hidden extras           | ×                 | ✓               | ✓            |
| Speed draft                   | 80                | 100             | 120          |
| RRP                           | £349              | £285            | £299         |

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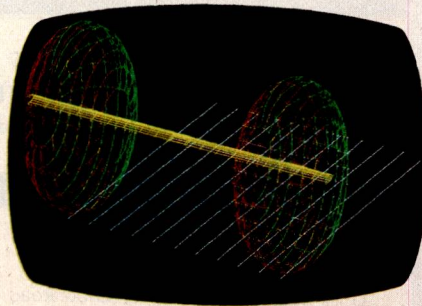
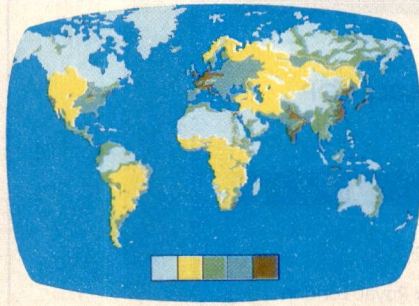
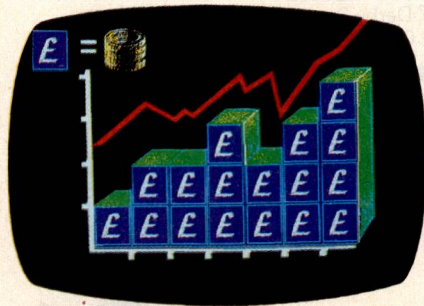
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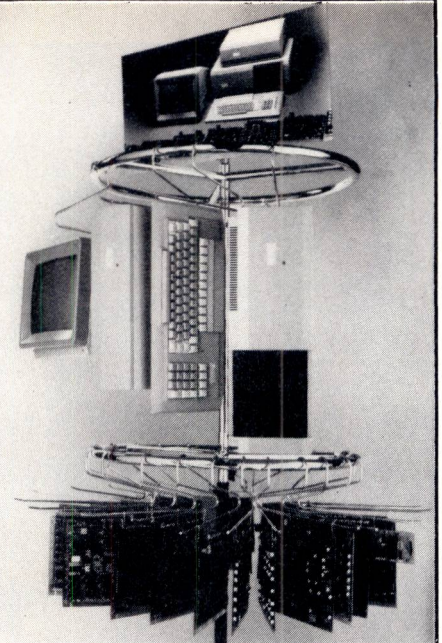
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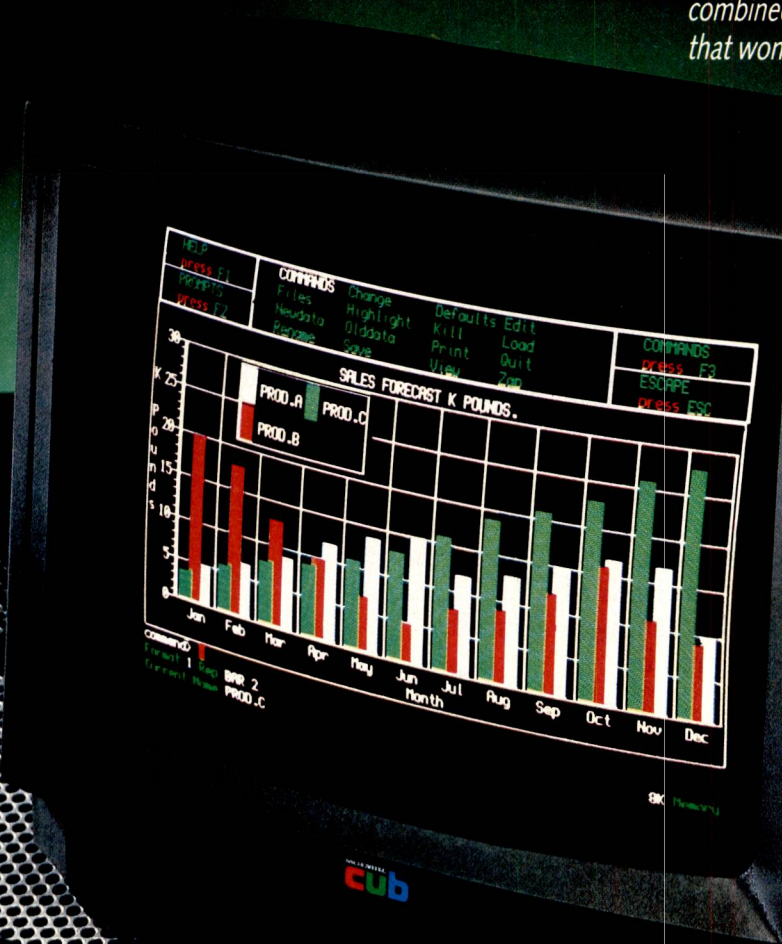
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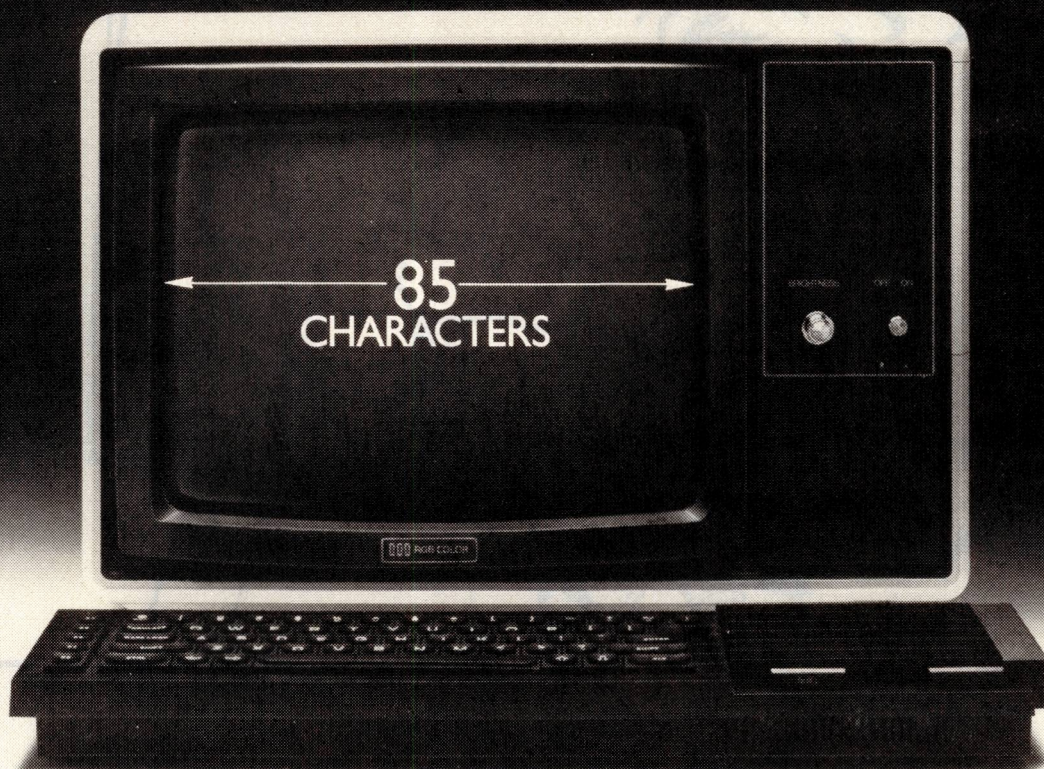
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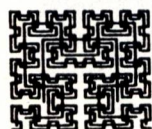
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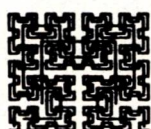
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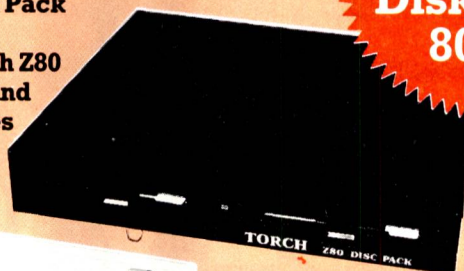


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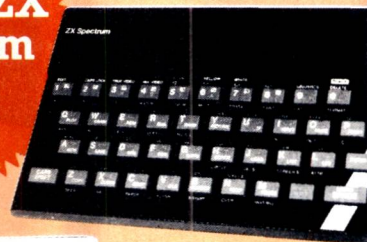
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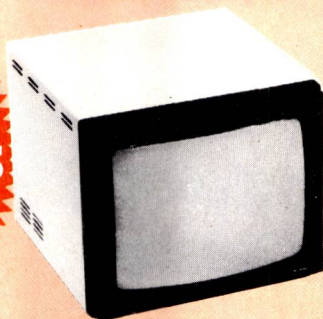
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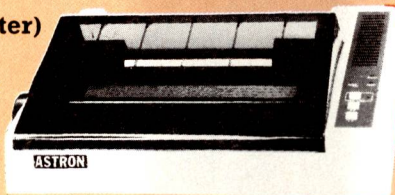


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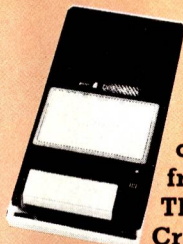
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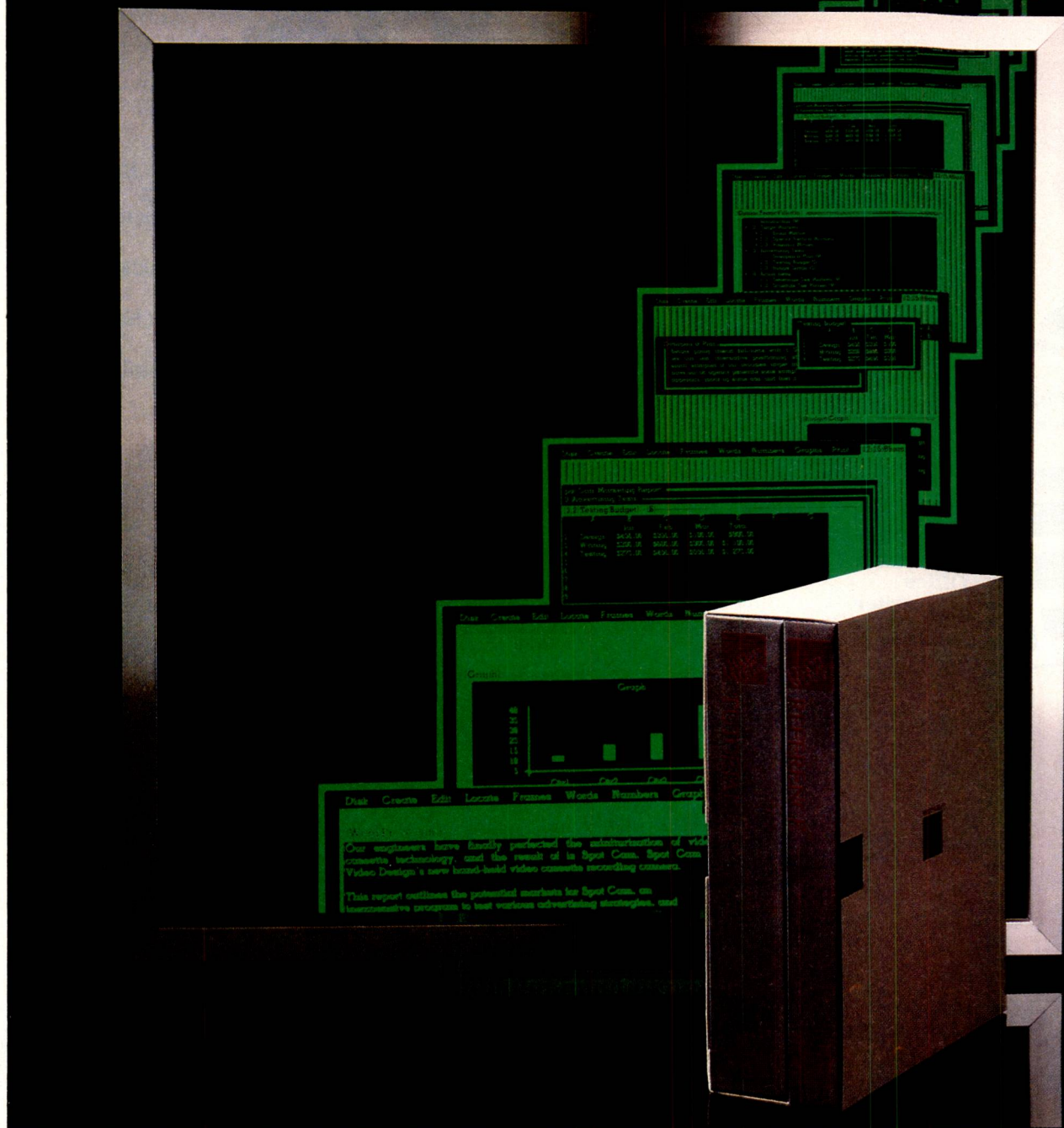
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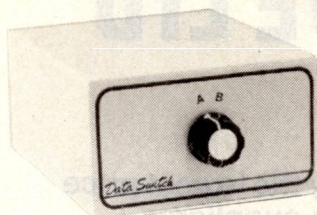
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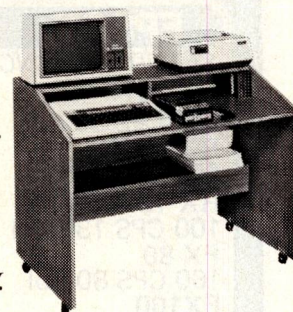
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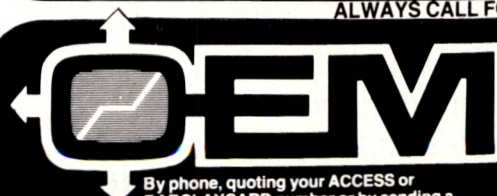
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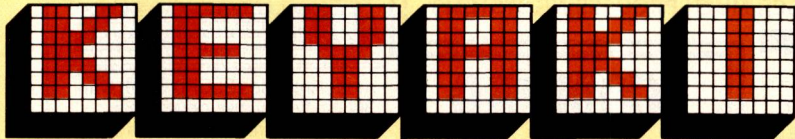
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PCW10

TRADE & EDUCATIONAL ENQUIRIES WELCOME



# BYTE SHOP News

We'll be exhibiting at the PCW Show at Olympia 2 and look forward to seeing customers both old and new. Our stand is No. 730, level 1.

Two major introductions to report this month are one on the hardware side and one software. Catching most people somewhat by surprise is the new portable PC from IBM – see 'Spotlight' for details. Ashton-Tate have also been busy with Framework, an integrated package that is billed as the ultimate in user friendliness and a logical extension of dBase II.

The Byte Shops are now part of Kode International plc Group which, with Kode's complementary interests in microcomputers generally, should enable us to offer an even better service to our customers.



## HOW COMMUNICATORS HELP SPEED THE MAIL FOR LAURENCE RICHARDS

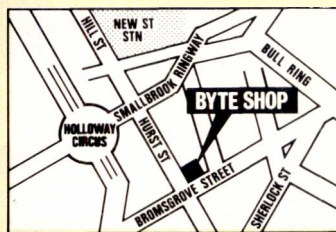
Laurence Richards are a successful word-processing bureau/mailing house based in the Midlands. Such is the prodigious number of individual mailings they handle – this can be as high as 20,000 in one run – that clearly they could not operate without computerisation.

Equipment consists of two Communicator microcomputers, one recently upgraded to a hard disk version for faster working and extra storage capacity, two portables and three Diablo printers. The Communicator's reliability, capacity for upgrading and wealth of software options have proved great assets. Software run on the Communicators include those old favourites WordStar and MailMerge for word-processing and labelling. They are also used to communicate with ICL mainframes to extract names and addresses from mailing lists using BSTAM. Service and support from the Nottingham Byte Shop "has always been of the highest quality".

## Getting the right computer

At the Byte Shops we've helped countless companies of all sizes improve their efficiency by the introduction of microcomputers. Generally these are required to perform routine business tasks – but, however similar the application, we invariably find that no two customers have exactly the same requirements. When you come to the Byte Shop, you'll find that we are far more interested in finding out what jobs you require the computer to do both now and in the future. We then tailor a complete system including not only the hardware but the software, and the peripherals to meet your individual needs. We believe this is the only sensible way to sell computers. On this spread you'll find a number of 'Typical Ready To Run' systems. However we won't sell one to you – unless you force us – without asking a few questions first.

### WHERE TO FIND US: BIRMINGHAM



Our Birmingham Business Centre situated in Hurst Street opposite the Hippodrome Theatre, is one of the longest established Byte Shops. Manager, Jim Attfield and his experienced staff are always available to discuss specific applications and to arrange demonstrations from the wide range of micros in stock.

### PROGRAMMERS CORNER

Wide selection of programming languages, plus utilities and tools from Microsoft, Digital Research, Microfocus, Xitan and Pulsar, incl. Basic, Fortran, Cobol, Pascal, Assembler, C & PL1.

### THE BYTE SHOP

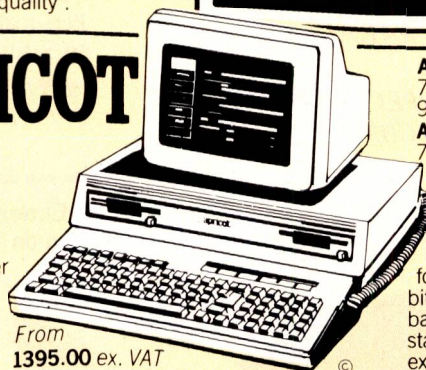


# THE BYTE SHOPS - W ON GETTING THE R

## ACT APRICOT

Already an outstanding success, the transportable Apricot offers a comprehensive specification at very low cost, making it a perfect system for the small businessman. The Xi models offer the advantages of Winchester disks in their most compact size yet – the revolutionary 3½" disk. New 12" screen is an optional extra for all models at a cost of £100. Included in the price are three operating systems MS/DOS 2.0, CP/M-86+, Concurrent CP/M-86 together with Microsoft and Personal BASICs, SuperCalc, SuperWriter, SuperPlanner and Asynchronous File Transfer Software.\*

\* Subject to availability



From **1395.00** ex. VAT

- Apricot; single 315Kb floppy disk drive; 9" monitor.....**1395.00**
- Apricot; twin 315Kb floppy disk drives; 9" monitor.....**1595.00**
- Apricot; twin 720Kb floppy disk drives; 9" monitor.....**1795.00**

**Apricot Xi;** 5Mb hard disk & 720Kb floppy disk drives; 9" monitor.....**2495.00**

**Apricot Xi;** 10Mb hard disk & 720Kb floppy disk drives; 9" monitor.....**2795.00**

### Apricot F1 (not illus.)

The revolutionary, transportable F1, offers the small businessman, for the first time, a full featured 16-bit micro that won't break the bank. Top specification includes standard 256Kb RAM expandable to 768Kb, 1x720Kb floppy disk drive, MS-DOS and Concurrent CP/M compatibility, remote operation, full featured keyboard, optional 'mouse' facility, ultra high resolution colour graphics. The stylish F1 comes with three popular software

packages, SuperCalc, SuperWriter and SuperPlanner .....**995.00**

### Apricot Portable (not illus.)

A range of three highly innovative portable models with memory options from 256-512Kb standard RAM and 720Kb single floppy disk storage. Stunning specification includes sophisticated speech recognition system, cordless full function keyboard, cordless 'mouse' (top models as standard) and flat LCD screen. Complete with SuperCalc, SuperPlanner and SuperWriter software. Stylish matching printer. 10Mb storage unit and carrying case are available as extras .....from **1695.00**

ALL PRICES EX. VAT

### TYPICAL APRICOT BUSINESS SYSTEMS

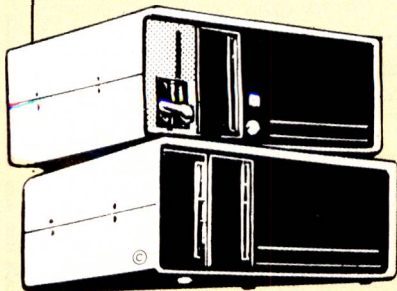
**Word Processing**  
Apricot F1; SuperWriter; letter quality printer .....**1480.00**

**Financial Planning**  
Apricot; SuperCalc 3 upgrade; dot matrix printer.....**2299.00**

**Database Management**  
Apricot Xi; dBase II; dot matrix printer.....**3335.00**

**Small Business A/C System**  
Apricot Xi; Pulsar Sales, Purchase and Nominal Ledgers and Invoicing; dot matrix printer.....**4379.00**

## COMART



Comart Communicator multi-user systems have expandability built in and are the most cost-effective way of sharing computer power amongst your staff. You can start with a Communicator system to suit your current requirements – up to nine people can share – and simply add new terminals as you grow. A considerable saving over buying a complete new computer each time.

### COMMUNICATOR MULTI-USER/MULTI-PROCESSING SYSTEMS

£2119 per user\*

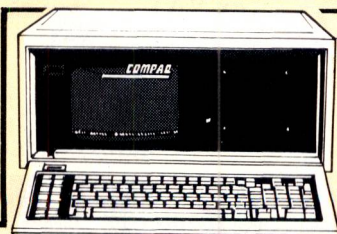
**Communicator CP1525M** with M-BOS operating system, including 5 display terminals, dot matrix printer and cables .....**10595.00**

£1800 per user\*

**Communicator CP520MP** including 5 display terminals, cables 6x processors and 6x64Kb memory .....**9095.00**

## COMPAQ

Following phenomenal success in America, you can now find the portable, fully IBM PC compatible, Compaq micros at your local Byte Shop. Spec. for the Standard



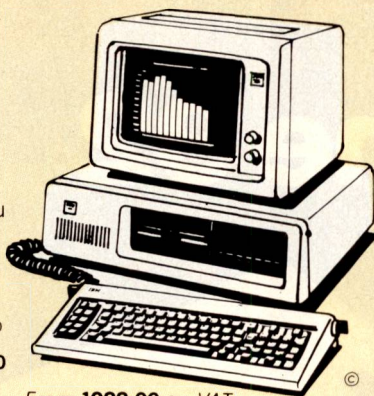
model includes 256Kb RAM, twin 360Kb floppy disc drives, high resolution screen and tough carry case.....**2195.00**  
'Plus' model as above but with single 256Kb floppy and 10Mb hard disk drives.....**3945.00**

ALL PRICES EX. VAT



# IBM/PC

The IBM PC's versatility means that it's equally at home in a small business or as a stand alone desk top in a large corporate company linked to a main frame. Should you require extra performance or speed, the IBM PC XT is an obvious choice.



**IBM PC:** dual 320Kb disk drives; 64Kb RAM; UK keyboard and screen

**1988.00**

**IBM PC:** dual 320Kb disk drives; 128Kb RAM; DOS 2.1; UK keyboard and screen

**2149.00**

**IBM PC XT:** 1 x 320Kb floppy disk plus 1 x 10 Mb hard disk; 128Kb RAM; ASYNCH COMMS; DOS 2.1; UK keyboard and screen

**4141.00**

## PC/XT ADD-ON'S & ADD-IN'S

**Alloy PC-Backup** - cartridge tape unit for backing up, storing and retrieving data from hard disk

**1.750.00**

From 1988.00 ex. VAT

**Microvitec 1446** - 14" colour monitor

**495.00**

**Expansion Unit 1** - 10 Mb hard disk unit for PC

**2.172.00**

**Expansion Unit 2** - 10 Mb hard disk unit for PC/XT

**1.978.00**

**Tallgrass Datasave** - 5 1/4" hard disk mass storage unit with 12, 20 or 35 Mb capacity plus integral streamer tape cartridge backup

**from 2,820.00**

**Hercules Graphics Card** - allows high resolution bit mapped graphics on monochrome display

**395.00**

**AST Megaplus Card** - includes 64 Kb RAM, 1 serial port plus clock/calendar + RAM spooler software

**319.00**

**AST 3780 Card & Software** - allows PC to communicate with m/f in bisynch protocol

**875.00**

**AST 5251 Card & Software** - allows interactive m/f comms with IBM Systems 34, 36 & 38

**835.00**

**Orchid PC Net Starter Kit** - local area network allowing file and disk sharing plus optional electronic mail from

**1350.00**

**PC Net Cards** - to link additional terminals to network from

**675.00**

**Quadram Cards** - full range available inc. memory expansion & colour graphics from

**194.00**

**IBM colour monitor plus adapter card**

**685.00**

**IBM printer inc. cable**

**469.00**

**Epson FX80 printer inc. cable**

**478.00**

**Brother Letter Quality Printer**

**445.00**

See Microserve panel for details of full maintenance and service facilities for the IBM PC/XT nationwide.

ALL PRICES EX. VAT

## TYPICAL IBM BUSINESS SYSTEMS

### Word Processing

IBM PC; Multimate, letter quality printer

**3135.00**

### Colour Spread Sheet

IBM PC; colour monitor; Symphony;

full width dot matrix printer; 2 pen plotter

**4999.00**

### Information Management

IBM PC XT; dBase II; dot matrix printer

**5119.00**

### Accounting System

IBM PC XT; Sales, Purchase and Nominal Ledgers. Invoicing and Payroll; dot matrix printer

**5720.00**

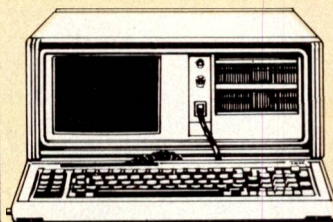
ALL PRICES EX. VAT

# SYSTEM SPOTLIGHT

## IBM PORTABLE PC

Logical development offering the benefits of PC computing in a self-contained portable package weighing in at a mere 30lb (13.6kg). Features 256Kb RAM expandable to 512Kb, 360Kb dual floppy disk drives, the latest DOS 2.1 operating system, 9" amber anti-glare screen (colour display optional) five expansion slots, and compatibility with the large and growing list of IBM PC software. Smart custom system carrying bag is included in the price

**2254.00**



ALL PRICES EX. VAT

# HERE YOU CAN COUNT ON YOUR COMPUTER.

## At a glance Computer Checklist

|                   | Act Apricot | IBM PC/XT | Comart | Compaq |
|-------------------|-------------|-----------|--------|--------|
| Colour graphics   | •           | •         | •      | •      |
| Multi-user        | •           | •         | •      | •      |
| Hard disk storage | •           | •         | •      | •      |
| Upgradeable       | •           | •         | •      | •      |
| Expandable        | •           | •         | •      | •      |
| Communications    | •           | •         | •      | •      |
| Transportable     | •           | •         | •      | •      |
| Networking        | •           | •         | •      | •      |

# TOP 20 SELLING SOFTWARE

- Lotus 1-2-3** - Remarkable integrated spreadsheet and information management package incorporating colour graphics for the IBM PC **375.00**
- dBASE II** - Powerful database management and applications generator with optional graphics and development tools **365.00**
- Symphony** - Complementary follow-up to 1-2-3 from Lotus including word processing, integrated spreadsheet, communications, database and colour graphics **550.00**
- SuperCalc 3** - Latest SuperCalc version with colour graphics rivaling Lotus 1-2-3 **295.00**
- WordStar** - Most popular wordprocessing program, easily integrated with MailMerge, SpellStar, Star index and SuperSort enhancements **295.00**
- Pulsar Accounts** - Complete integrated business accounting system includes sales, purchase, nominal ledgers, data analysis, stock control, invoicing and payroll - for Apricot and IBM PC **195.00**
- SuperCalc 2** - Sophisticated, easy to use financial spreadsheet for in depth analysis, modelling and forecasting **195.00**
- Multi-Mate** - New standard in fast, easy to use, function key driven wordprocessing for the IBM PC **330.00**
- Open Access** - Exciting new integrated business package rivaling Lotus 1-2-3 with WP, Database, comms and 3-D graphics **450.00**
- CBASIC** - Widely used commercial programming language for business applications development, interpreter also available **115.00** (CP/M86.250.00)
- Friday** - Personal file management package for the novice with quick custom reporting **195.00**
- GraphStat** - Up and coming statistics and colour graphics package for the IBM PC **195.00**
- Cardbox** - Simple to use data retrieval and information management tool **155.00**
- Level II Cobol** - Mainframe level II compiler, well suited for new applications development: tools and utilities available **965.00**
- dBASE III** - Powerful easy to use database with enhanced reporting facilities and ability to print mailing labels from files **495.00**
- Framework** - Integrated package featuring word processing, spreadsheet, graphics, data management **495.00**
- Delta** - Comprehensive and sophisticated database program with '3-D' file structures, links to Lotus 123, MultiPlan and WordStar **495.00**
- BSTAM** - Communications package for sending and receiving CP/M files over telephone lines **133.00**
- Flight simulator** - Full colour game for both the novice and the potential fighter pilot on the IBM PC **37.00**
- Pascal MT +** - Comprehensive integrated language for developing production quality software **269.00** (CP/M86.462.00)

ALL PRICES EX. VAT

## microserve

An integral part of the Byte Shops, **Microserve** provides a complete range of servicing and maintenance plans nationwide for computers such as the IBM PC and Communicator plus peripherals from Epson, Anadex, Qume, Wyse and Volkercraig. **'Microsure'** - our speedy nationwide on site maintenance contract for a 'once only' annual fee. **'Microswap'** - component exchange service. **'Micromend'** - workshop repair

and up grades. **'Microcall'** - on site maintenance and repair charged on a time and materials basis. **'Microtrain'** - runs product training courses for your own service engineers. Call into your local Byteshop for further details or 'phone **0480 215005** for a Microserve Information Pack.



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Manager Jim Attfield

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Tel: 041-221 8202  
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Tel: 0703 334711  
Manager Russ Wilmoth

**BRISTOL**  
Tel: 0272 290651

**BYTE SHOP HEAD OFFICE**  
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Little Paxton, Cambs. PE19 4EL.  
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# OKI Microline 92

## So fast - and NLQ



NLQ = Near Letter Quality.

It's just one of the many outstanding features which put the OKI Microline 92 matrix printer at the top of the 80 column league. Add to this standard print at 160 cps, high resolution graphics, downline-loadable character sets, subscript, superscript and underline capability, and you will see why the Microline 92 is an unbeatable price/performer.

The Microline 93 offers the same unrivalled specification to users requiring a full 136-column format.

And if all this is not enough, both machines are available with our unique IBM Plug 'n' Play Kit, ensuring full compatibility with the IBM PC.

An even more impressive feature list, including a print speed of 200 cps, defines the 136-column Microline 84. In addition to its increased throughput capability, the optional Automatic Cut Sheet Feeder permits maximum use of the near-letter-quality print mode.

Quality, reliability and unbeatable price/performance are of course hallmarks of the entire OKI Microline range, including the ever popular Microline 80, still a best-selling entry-level printer.

The range is completed by the Microline 82A (80 col) and the Microline 83A (136 col) which offer a print speed of 120 cps amongst a host of other features.

OKI Microlines - the unbeatable printer family!



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CP/M-86 for CA801/CA802, including utilities £199

**SPECIAL OFFER . . . CA802 and CP/M-86 £695**

Either 80-bus format board enables retention of the Z80 card to run your existing software. Both cards will read or write IBM PC compatible discs and all Gemini formats. A 8088 bus expansion connector is also provided.

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Coming soon, Concurrent CP/M-86

**COSTGOLD RESEARCH, THE OLD SCHOOL,  
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**EXCET EMU3 MONITORING UNIT (not PX8)** £86.00  
Measures temperature, light, resistance, power, volts, current and time.  
(Leads and probes supplied)

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Displays E.C.G. trace, both visual and audio pulse rate and personal details.  
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Measures concentration in p.p.m. of 6 different gases.  
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**PRESSURE TRANSDUCER INTERFACE** £55.00  
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Response DC & AC to 5kHz or above  
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All units are extremely accurate and have fully supporting software on 40 or 80 track disc or tape. All with a screen dump facility and audio/visual variable alarm levels. Display is in graphical form, extra-height characters or tabular display with variable sample rate from 0.1 secs to 1,000 hrs with print out option.

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THE ORIGINAL FREE OF CHARGE dial up data base.  
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FP1500 Heavy Duty 25 cps daisy wheel  
RS232 interface, bi directional printers,  
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CALL FOR MORE DETAILS

## COMPUTER 'CAB'

All in one quality computer cabinet with integral switched mode PSU, Mains filtering, and twin fan cooling.  
Originally made for the famous **DEC PDP8** computer system costing thousands of pounds. Made to run 24 hours per day the PSU is fully screened and will deliver a massive +5v DC at 17 amps, +15v DC at 1 amp and -15v DC at 5 amps. The complete unit is fully enclosed with removable top lid, filtering, trip switch, 'Power' and 'Run' LEDs mounted on Ali front panel, rear cable entries, etc. Units are in good but used condition - supplied for 240v operation complete with full circuit and tech. man. Give your system that professional finish for only £49.95 + Carr. Dim. 19" wide 16" deep 10.5" high. Useable area 16" w 10.5" h 11.5" d. Also available **LESS PSU**, with FANS etc. Internal dim. 19" w 16" d 10.5" h. £19.95. Carriage & insurance £9.50.

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**MUFFIN-CENTRA** standard 4" x 4" x 1.25" fan supplied tested EX EQUIPMENT 240 v at £6.25 or 110 v at £4.95 or BRAND NEW 240 v at £10.50. 1000's of other fans Ex Stock. Call for Details. Post & Packing on all fans £1.60

SAVE  
£250

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The "Do Everything Printer" at a price that will NEVER be repeated. Standard CENTRONICS parallel interface for direct connection to BBC, ORIC, DRAGON etc. Superb print quality with full pin addressable graphics and 4 type fonts plus HIGH DEFINITION internal PROPORTIONAL SPACED MODE for WORD PROCESSOR applications. 80-132 columns, single sheet, sprocket or roll paper handling plus much more. Available ONLY from DISPLAY ELECTRONICS at the ridiculous price of **ONLY £199.00** + VAT Complete with full manual etc. Limited quantity - Hurry while stocks last.  
Options: Interface cable (specify) for BBC, ORIC, DRAGON or CENTRONICS 36 way pig £12.50. Spare ribbon £3.50 each BBC graphics screen dump utility program £8.60. Carriage and Ins. £10.00 + VAT

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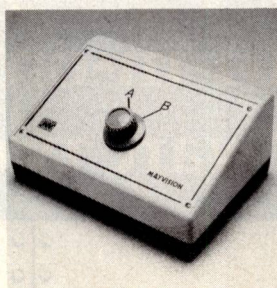
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8k Eprom + Disk containing assembler and program examples.

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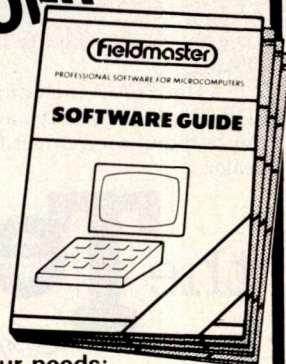
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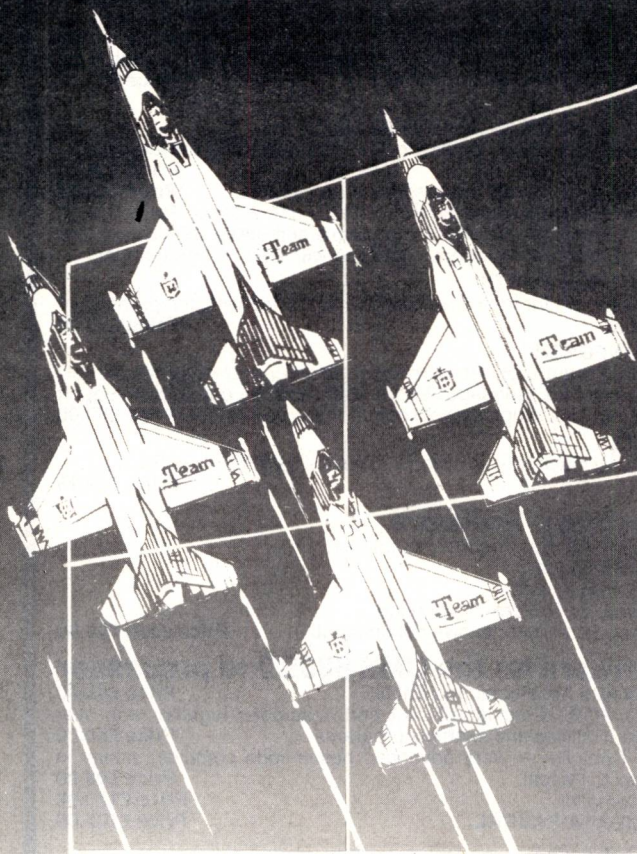
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Dear Mr SMODGENS  
Congratulations!

You have exceeded your target for the first half year. The  
the results you achieved:

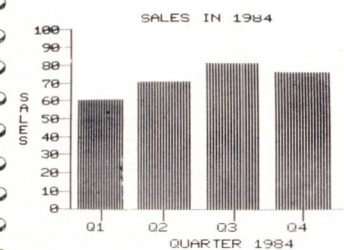
|        |     |
|--------|-----|
| Target | 200 |
| Result | 300 |

Lets all pull together for a fantastic 2nd half year!

Yours sincerely

R. G. Bulkin  
Sales Manager

## GRAPHICS



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### RETAILER RAW DATA REPORT

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THE FOUR  
WICKHAM  
CRAWFORD  
OVENTRY  
SMITH

MICHAEL M  
THE OLD VI  
CAUSWAY C  
PARSLEY BR  
WARRINGTON  
GEORGE

GOOREY AND S  
GOOREY HOUSE  
GOOREY LANE  
WHARTON  
SALFORD  
GOOREY

GOOREY AND S  
GOOREY HOUSE  
GOOREY LANE  
WHARTON  
SALFORD  
GOOREY

GOOREY AND S  
GOOREY HOUSE  
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WHARTON  
SALFORD  
GOOREY

GOOREY AND S  
GOOREY HOUSE  
GOOREY LANE  
WHARTON  
SALFORD  
GOOREY

SALES RESULTS BY RETAILER

COMPANY SHAM 50/50 TOT TOT SHAM 50/50

PALFREYMAN 160 20 300 130 1

LITTLEJOHN 120 10 260 160

MICHAEL M 150 100 10 170 120

MICHAEL M 100 50 20 170 170

GOOREY AND S 150 30 40 220 170

GOOREY AND S 130 20 10 160 140

SOUTHERN MILLS 230 40 12 282 250

GOOREY AND S 130 20 10 160 140

GOOREY AND S 130 20 10 160 140

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## CALC

### FORECAST FOR 12 MONTH PERIOD

| MONTH  | SALES | QST | INCOME | RENT | AUS | SALES | OTHER | EX |
|--------|-------|-----|--------|------|-----|-------|-------|----|
| 1 JAN  | 110   | 44  | 66     | 5    | 10  | 22    | 22    |    |
| 3 MAR  | 210   | 80  | 120    | 5    | 10  | 40    | 40    |    |
| 4 APR  | 200   | 80  | 120    | 5    | 20  | 40    | 40    | 1  |
| 5 MAY  | 190   | 76  | 114    | 5    | 20  | 38    | 38    | 1  |
| 6 JUN  | 200   | 80  | 120    | 5    | 20  | 40    | 40    | 1  |
| 7 JUL  | 190   | 76  | 114    | 10   | 20  | 38    | 38    | 1  |
| 8 AUG  | 120   | 48  | 72     | 10   | 20  | 24    | 24    |    |
| 9 SEP  | 140   | 56  | 84     | 10   | 20  | 28    | 28    |    |
| 10 OCT | 160   | 64  | 96     | 10   | 30  | 32    | 32    | 1  |
| 11 NOV | 210   | 84  | 126    | 10   | 30  | 42    | 42    | 1  |
| 12 DEC | 220   | 88  | 132    | 20   | 30  | 44    | 44    | 1  |
|        | 1940  | 776 | 1164   | 95   | 230 | 388   | 388   | 1  |

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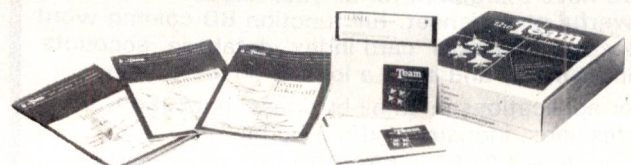
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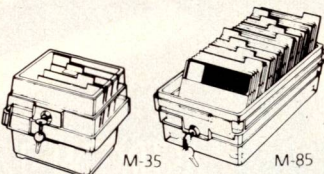
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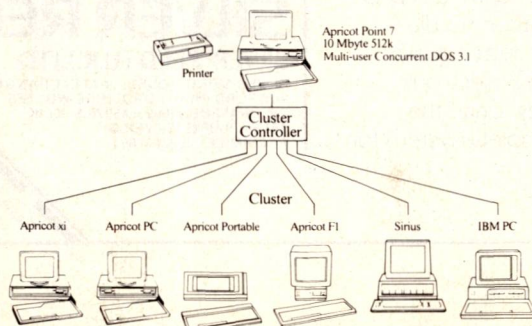
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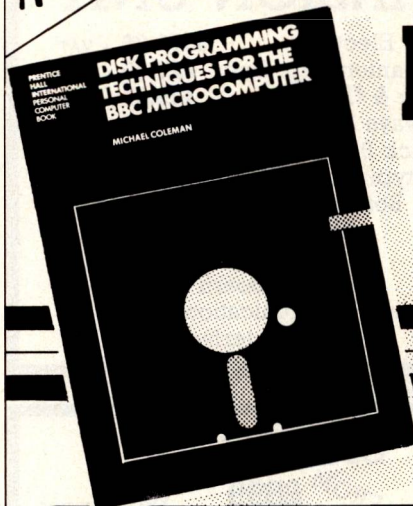
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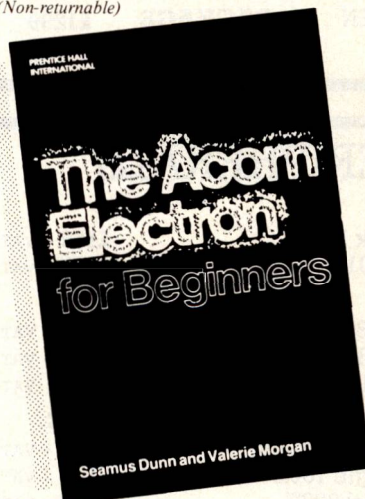
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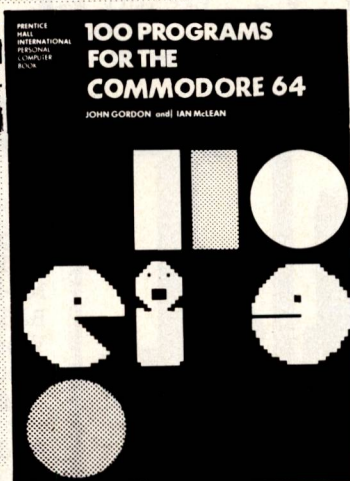


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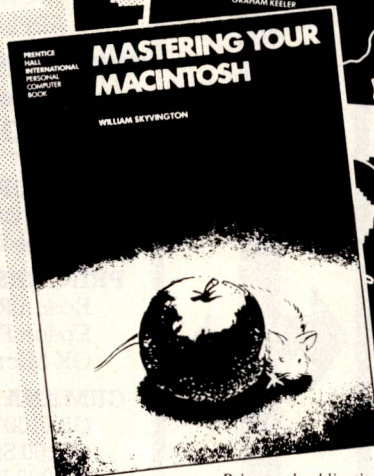
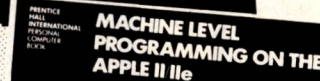


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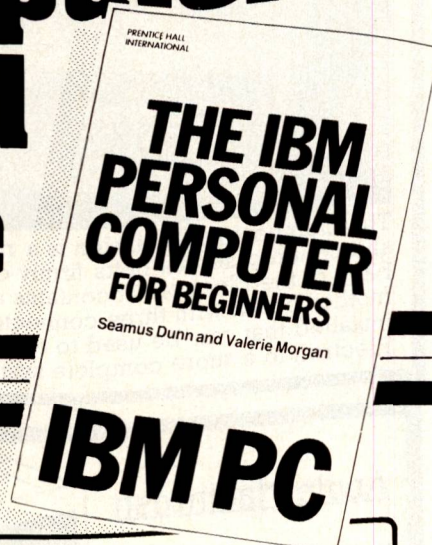


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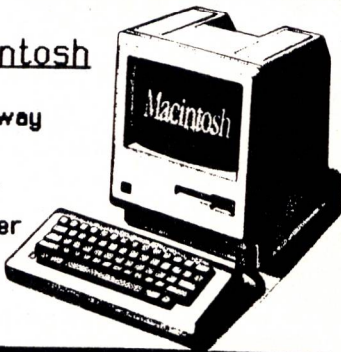
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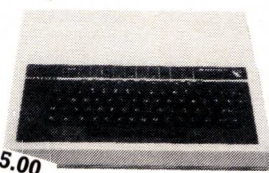
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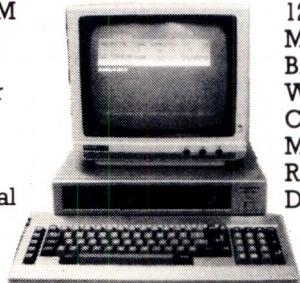
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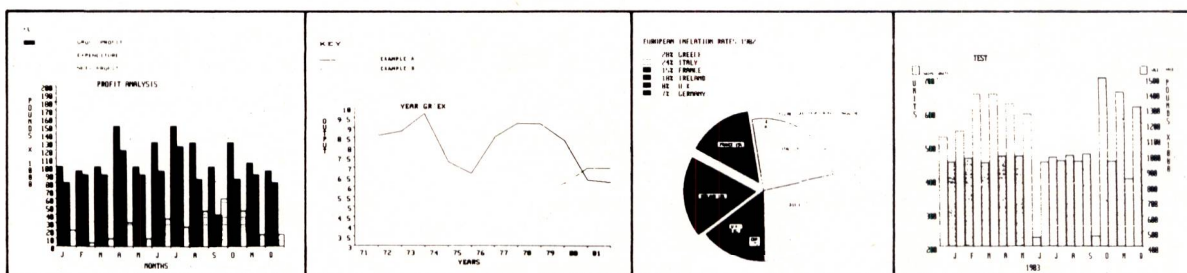
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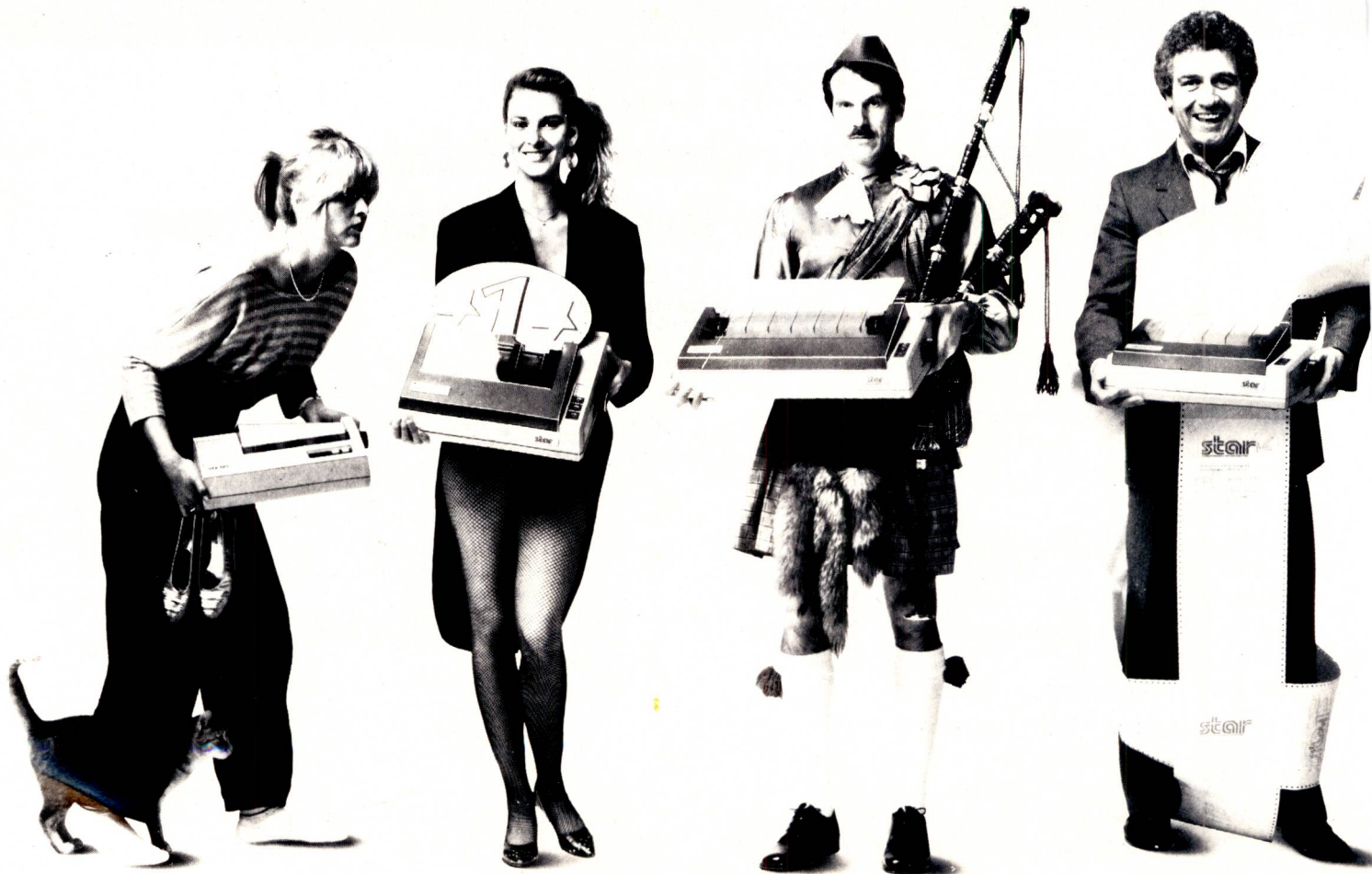
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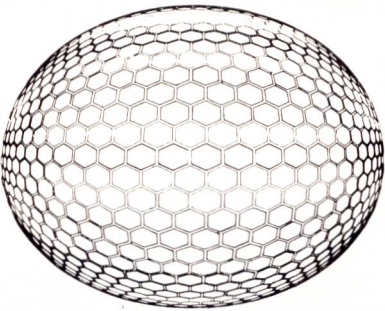
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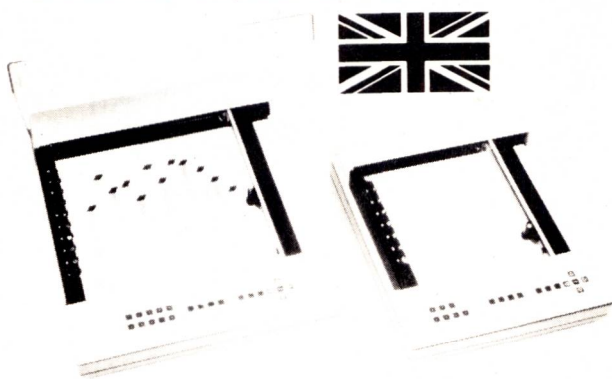
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| 16k Serial Parallel Buffer   | 90           | Diablo 630                   | 270          |
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| 64k Serial Parallel Buffer   | 160          | <b>QUME</b>                  |              |
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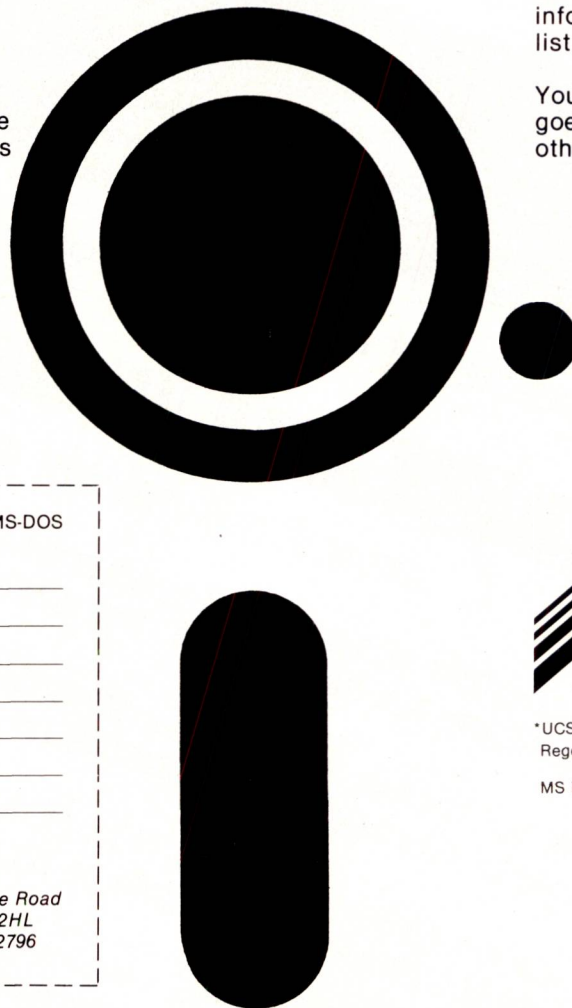
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Module: Press ESC for help

PATIENT DETAILS

|                      |                            |
|----------------------|----------------------------|
| Name: John Smith     | N.I. No: X212345/6789      |
| Address: 6, The Elms | Sex: M                     |
| Village Rd           | Date of Birth: 09-10-47    |
| Newton               | Marital Status: Single     |
| Survey               | Admission No.: SH 94620/P  |
| G.P.: Dr. R. Jones   | Admission Date: 07-06-93   |
| Height: 5ft 9ins     | Ward: Men's Surgical       |
| Weight: 12st 10lbs   | Consultant: Dr. T.H. White |

Symptoms: Lower abdominal pain, Vomiting, High Temperature.  
Symptoms recurring over past three months.

Diagnosis: Suspected appendicitis

Treatment: Admit for observation. Possible appendectomy.

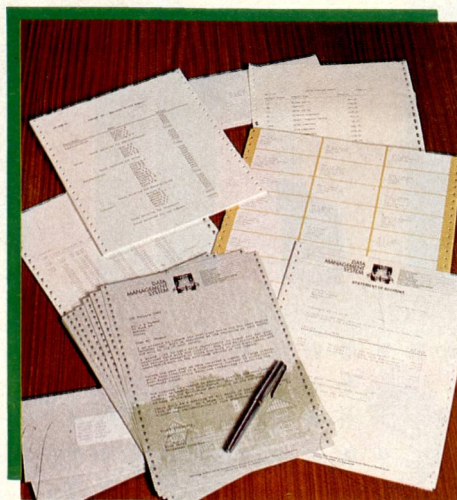
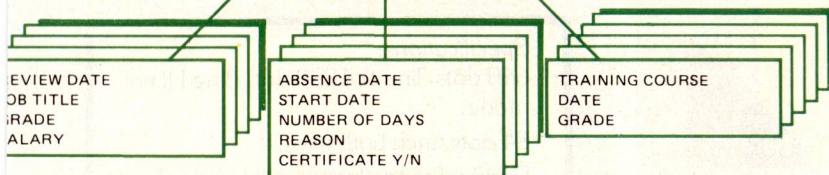


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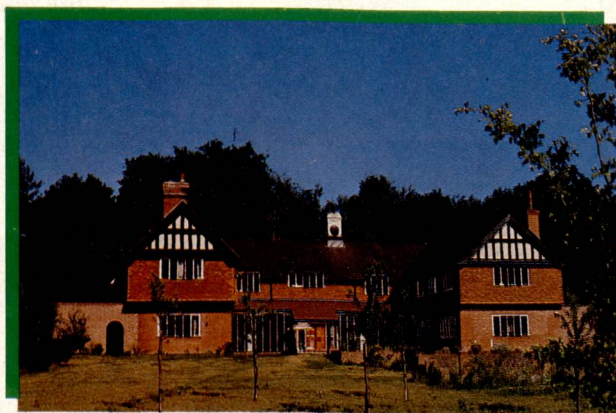


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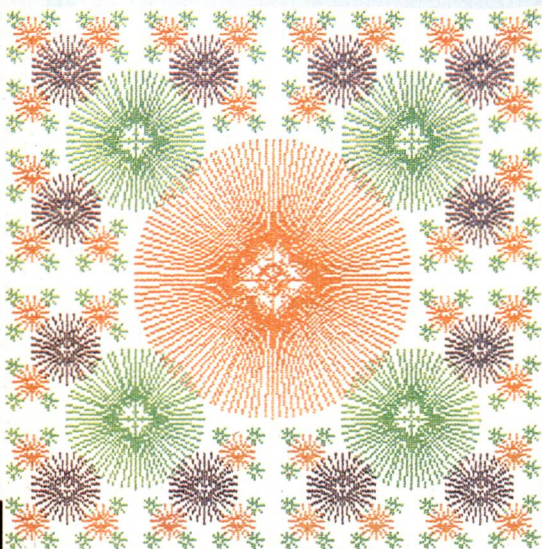
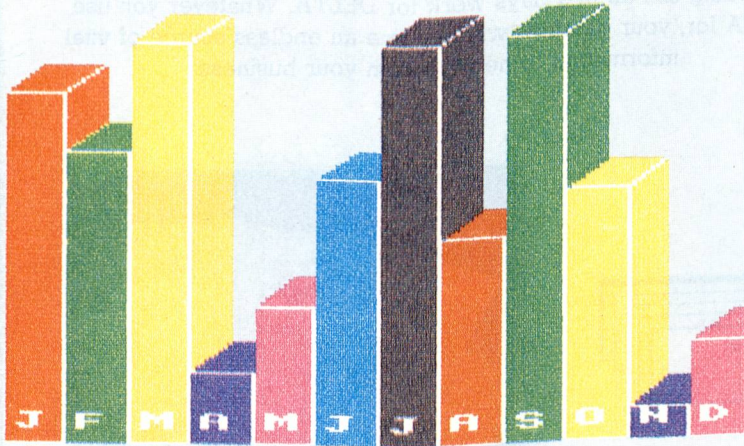


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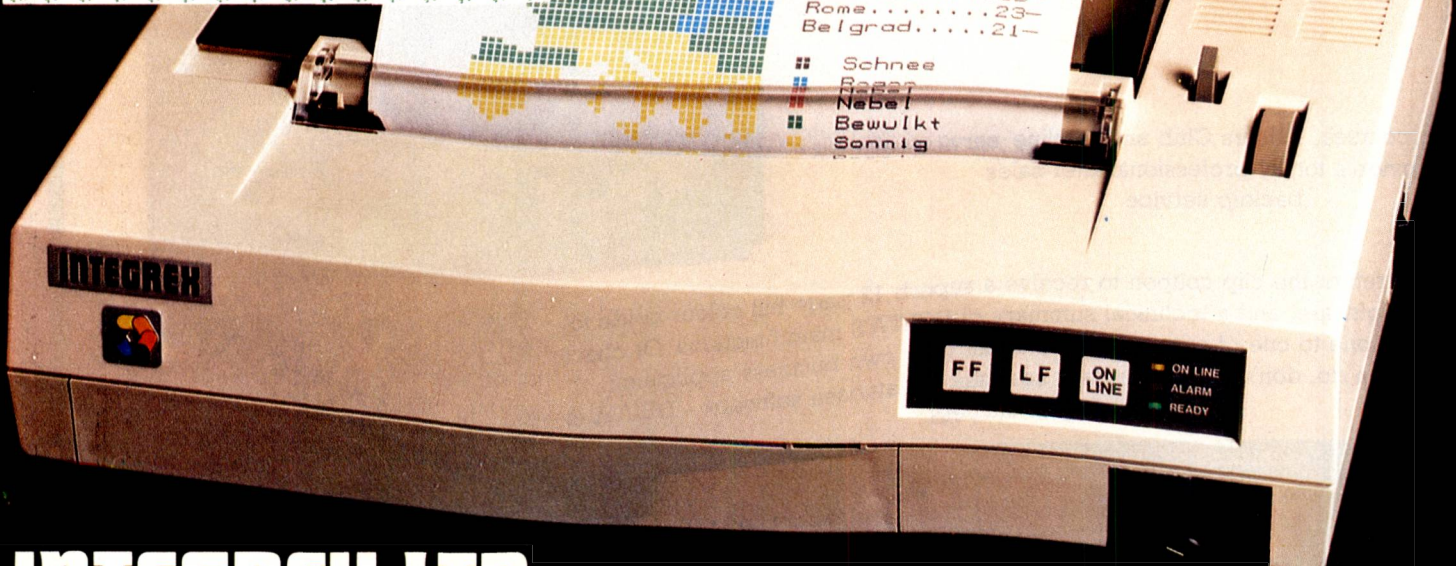
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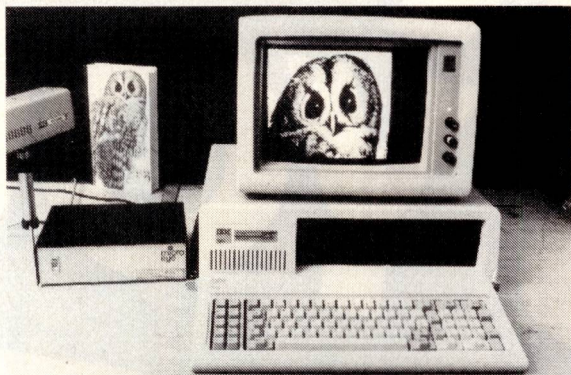
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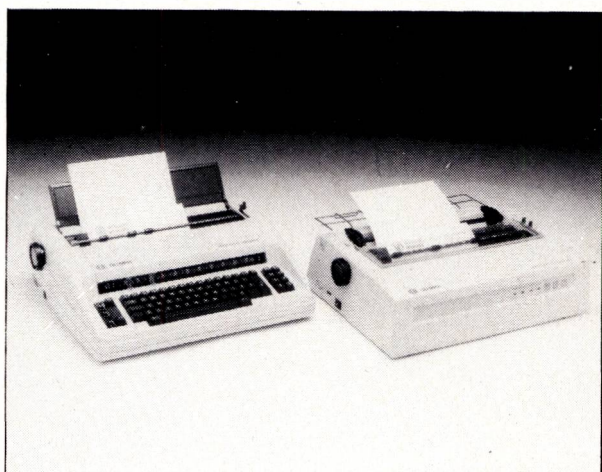
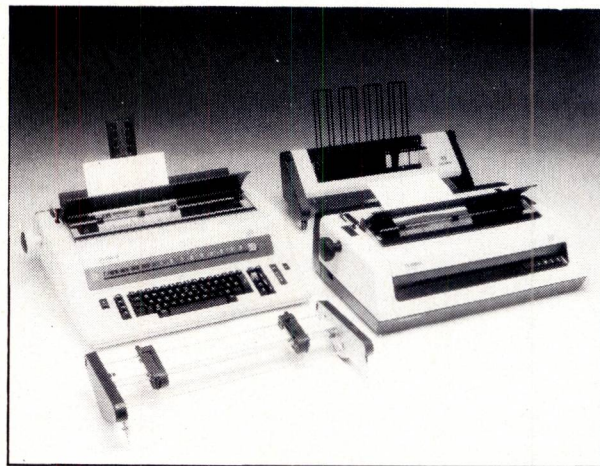
102 ON/OFF-Line. Error.

103 ON/OFF-Line. Error.

Bold print.

Expand print. Double print.

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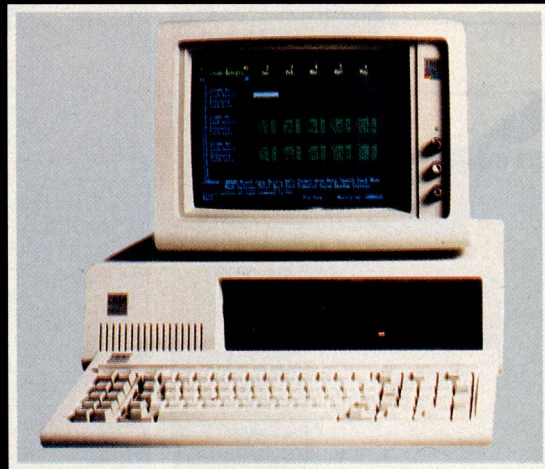
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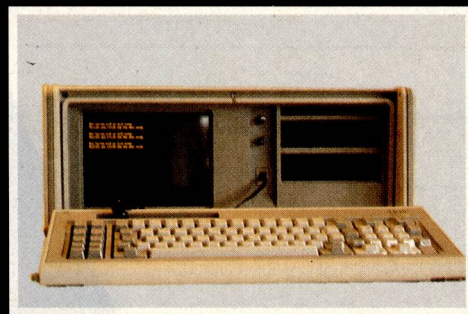


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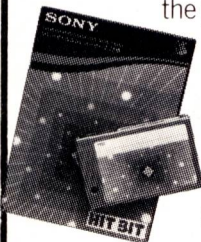
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Plus a unique optional feature – **MLT001 LIGHT PEN**. This provides you with unlimited flair and flexibility in colour graphics design. This feature comes complete with a software package containing some intriguing graphic facilities.



AVAILABLE  
END OCTOBER

**CBP 3000 14" MONITOR STYLE COLOUR TELEVISION**

with removable smoked glass screen for higher definition

**£199.95**

**MLT001 LIGHT PEN** **£89.95**

PRICES SHOWN INCLUDE VAT AND ARE CORRECT AT TIME OF GOING TO PRESS. E. & O.E.

RING TELEDATA 01-200 0200 FOR DETAILS OF YOUR

NEAREST STOCKIST.



# compatibility...

Home Computing brings you a complete compatibility in hardware and software. To cater for all home computing needs, Axis have selected in these pages an unbeatable, top value-for-money

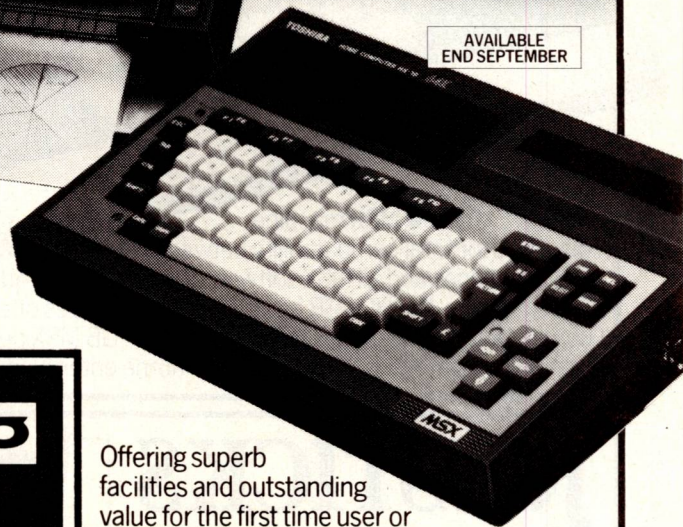
range of MSX computers, colour monitors, peripherals and software for you to choose from. "We believe that when you discover the benefits of MSX computing no other system will do".

**TOSHIBA**



## The Star Value TOSHIBA HX10

The first MSX computer to be introduced into the U.K.



AVAILABLE  
END SEPTEMBER



### DR202 DATA RECORDER

Top of the range machine offering a host of high technology features.

**£44.95**

**SANYO**

Offering superb facilities and outstanding value for the first time user or enthusiast. 64K Ram, 16 colour graphics, RF, video and audio connectors, plus ports for printer, disk drive and data recorder. (Including starter pack software).

**£279.95**

### 140E MONITOR STYLE COLOUR TELEVISION

The perfect partner for the HX10, providing excellent picture and sound quality.

**£189.95**

### HX-P750 PLOTTER PRINTER

Easily connected to the HX10 through the printer interface. This printer features image and character plotting in 4 colours – red, green, blue and black – making it ideal for colourful graphs, pie and bar charts. Plotting speed is 285 steps per second.

**£249.00**

DON'T FORGET TO ASK YOUR DEALER FOR DETAILS OF CREDIT FACILITIES, EXTENDED GUARANTEES, ETC. AVAILABLE ON CERTAIN ITEMS.

**AXIS**  
AT HOME WITH TECHNOLOGY

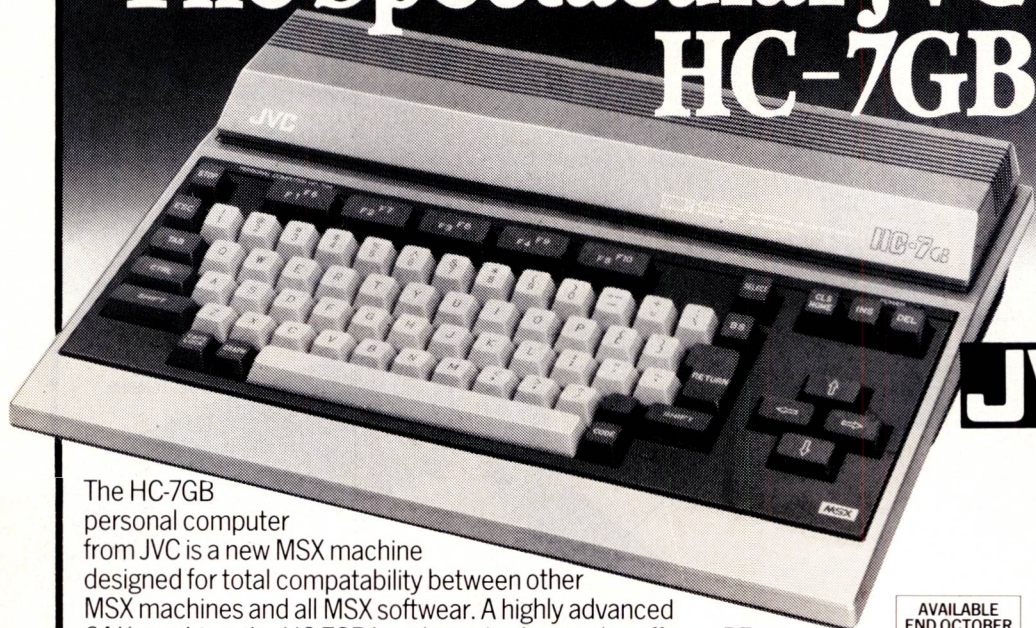


# THE UNIQUE **MSX**..amazing SYSTEM

When you buy your MSX computer, you enter a new dimension of Home Computing with software options on disk, ROM cartridge or cassette tape.

Periferal options cover colour monitors, printers, disk

## The Spectacular JVC HC-7GB



The HC-7GB personal computer from JVC is a new MSX machine designed for total compatability between other MSX machines and all MSX software. A highly advanced 64 K machine, the HC-7GB has three display modes offering RF, composite video and RGB outputs. The HC-7GB MSX personal computer from JVC is the final word in home entertainment.

AVAILABLE  
END OCTOBER

**£275.00**

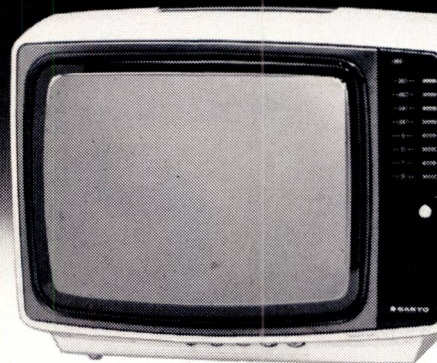
### THE JVC 7255 GB 14" COLOUR TELEVISION COMPUTER MONITOR



With full  
remote control

**£269.95**

### SANYO CTP3132 14" PUSH BUTTON COLOUR TELEVISION



The ideal budget price television for  
your home computer unit. Great value  
for money at

**£179.95**

### SONY PRN/C41 PLOTTER/PRINTER

This Plotter/Printer produces red, green,  
blue and black images and characters.  
Pen replacement is easy and it takes a  
wide choice of paper  
sizes.

**£249.95**

## JOYSTICKS

For extra versatility and sensitivity in  
control there are a range of high quality  
joysticks available from these famous  
manufacturers offering such features as  
double trigger and suction stability pads.

**TOSHIBA**

**HX-J400 £12.95**



**SANYO**  
**MJY 002 £12.95**



**JVC** **HCJ615 £12.95**



**SONY JS 55 £19.95**

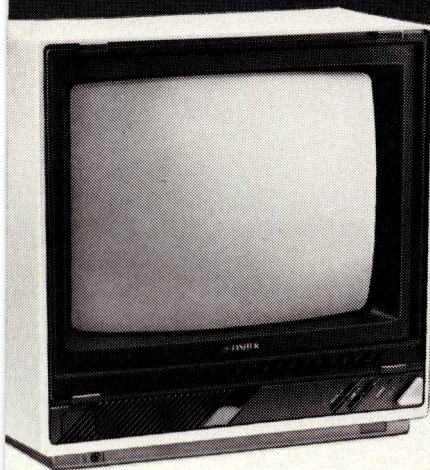


# versatility

drives, light pens, plotters, joysticks, data recorders and RAM cartridges from many top name manufacturers in the home electronics field.

Their performance offers you unrivalled graphic and sound quality together with outstanding simplicity of use.

## THE INCREDIBLE FISHER CFB 1410 P MONITOR STYLE COLOUR TELEVISION



This superb, high technology 4" monitor style television has earned a high quality reputation as a reference in the field of home computer

monitoring. It features a full 17 function infra red remote control housed

in the front of the set. Other sophisticated facilities include direct audio/visual terminals in/out and smoked glass filter for perfect picture definition.

**FISHER £269.95**

## SOFTWARE



Introduction to your MSX computing, Toshiba offer a pack of 5 exciting computer games for **ONLY £30**

Pack consists of: ● 3D Golf ● Trick Boy ● Clapton II ● Pyramid ● Polar Star (Offer only available while stocks last) Individual games available at **£7.95 each**

**SONY ROM CARTRIDGE SOFTWARE** A range of sophisticated Sony Rom Cartridge Software is available at prices up to **£19.95**



DON'T FORGET TO ASK YOUR DEALER FOR DETAILS OF CREDIT FACILITIES, EXTENDED GUARANTEES, ETC. AVAILABLE ON CERTAIN ITEMS.



### SANYO DR201 DATA RECORDER

An AC only recorder styled for computer use with all controls conveniently placed on top of the machine for ease of use.

**£34.95**



### SANYO DRI01 RECORDER

Specifically designed for use with personal computers, with phase shift switch, speaker monitor and AC/DC operation.

**£34.95**

### SONY TCM737 DATA RECORDER

A mains or battery operated recorder ideal for use with your home computer.

**£39.95**

### JVC HC-R105 DATA RECORDER

The stylishly designed HC-R105 data recorder is an example of a machine produced to offer superb user convenience, exceptional performance parameters and reliable data transfer. The HC-R105 is a high speed machine giving very short access times to data.

**£89.95**



**JVC**

### KNIGHTS:

- KNIGHT-OTHELLO** £5.95  
The classic game now on MSX.
- VICIOUS VIPER** £5.95  
Eat the men but don't bite your tail.
- EXPLODING ATOMS** £5.95  
A strategy game for two players.
- SMASH OUT** £5.95  
With key or joystick control.
- CAVE ADVENTURE** £5.95  
Negotiate the labyrinth of treasures.
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Realize the potential of your MSX.
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Demonstrate your excellent MSX graphics.
- TYPING TUTOR** £5.95  
Score by response to flashing keys.
- JUNIOR MATHS** £5.95  
Teaches children to add and multiply.
- MSX BASIC TUTORIAL PART 1** £5.95  
Learn MSX Basic programming.
- MACHINE CODE LANGUAGE** £5.95  
Write your own machine code programs.
- KNIGHTS MAIL LIST** £14.95  
Store addresses and print labels.
- BUDGET ACCOUNTS** £14.95  
Accounts with special forecast feature. (Available on disk or cassette).

### KUMA:

- DRILLER TANKS** £8.95  
Fight in tunnels fire breath Hectoriens.
- BINARY LAND** £8.95  
Unite the couple in the complex maze.
- FIRE RESCUE** £7.95  
Rescue the mice from a burning building.

### ERIC & THE FLOATERS

- ERIC & THE FLOATERS** £5.95  
Recover treasure from the evil floaters.
- DOG FIGHTER** £6.95  
Blast enemy aircraft out of the skies.
- HYPER VIPER** £7.95  
Avoid venomous vipers in the labyrinth.
- SPOOKS AND LADDERS** £6.95  
Trap spooks in holes & escape the mine.
- COCO IN THE CASTLE** £6.95  
Rescue the maiden from the king's castle.
- CRIBBAGE** £5.95  
Play 6 card cribbage with your MSX.
- HOLDFAST** £5.95  
A local politics strategy game.
- HOME BUDGET** £14.95  
Control your home income and expenses.
- WDPRO:- Wordprocessor** £29.95  
A professional quality wordprocessor.
- DATABASE** £19.95  
A professional database program.
- ZEN MACHINE CODE PROGRAMMING SYSTEM** £19.95  
Generate Z80 assembler language programs.
- KUMA FORTH** £39.95  
A fully structured self extending language.
- COMMUNICATIONS WITH VIEWDATA** £19.95  
Communicate through your modem.
- SPEECH SYNTHESIS** £69.50  
(includes hardware card)  
Typed in words can be spoken.

### QUICKSILVA:

- FRED** £7.95  
Fred's adventures under the pyramids.
- BOOGABOO (The Flea)** £7.95  
Avoid a deadly dragon inside deep caves.
- ANT ATTACK** £7.95  
Escape the ancient city fighting ants.
- THE SNOWMAN** £7.95  
Build a snowman avoid Monsters & Flames.
- GAMES DESIGNER** £9.95  
Modify existing or write your own games.



### AMPALSOFT:

The "CHESHIRE CAT EDUCATIONAL SERIES" of programs will be made available to MSX users.  
**ABOVE ARE ONLY A FEW OF THE MANY PROGRAMS AVAILABLE FOR YOUR MSX BY MAIL ORDER OR FROM YOUR LOCAL STOCKIST.**



AT HOME WITH TECHNOLOGY



IF IT ISN'T SANYO, YOU  
COULD END UP FEELING LIKE TH







Strange, some people don't know an awful lot about Sanyo computers.

They don't know that Sanyo make a complete range of micros from single 160KB disk drives to twin double-sided, double density 640KB disk drives.

They don't know that Sanyo, unlike some manufacturers, have a vast factory dedicated solely to designing and producing computers, thus ensuring the highest quality.

They don't know about the huge range of standard application and specialist software available, let alone the powerful business systems package provided with every Sanyo micro.

They don't even take the time to fill in the coupon to find out the facts.

Some people apparently are going to end up making a bit of a monkey of themselves.

SEE SANYO, THEN DECIDE

RETURN TO: MARKETING DEPT, SANYO MARUBENI (UK) LIMITED, SANYO HOUSE, OTTERSPOOL WAY, WATFORD, HERTS.

NAME

COMPANY

POSITION IN COMPANY

ADDRESS

TEL. NO.

PCW1

COMPUTERS SHOWN: MBC550, AND MBC4050, BOTH WITH 128KB RAM (EXPANDABLE TO 256KB/384KB).





# New Paper Tigers. The printers you'll pounce on!



With four models in the range, plus IBM-compatibles, Paper Tigers cover *all* your computer print-out needs.

Multiple speeds (including a *very fast* 400 characters per second) for draft, text and letter quality dot matrix printing; word processing features; graphics and full colour capability; multi-part or single sheets handled with ease; choice of 80 or 132-column widths – *plus* combined parallel and serial interfaces for total operating flexibility.

See Paper Tigers in action. Contact Dataproducts *now* for the name of your nearest Dealer. Take a look at the range on display, and discover the features that knock spots off the competition.

Then buy the one that's *exactly* right for your needs and make sure *you're* in with a chance of winning an African photo-safari, in the biggest printer promotion ever!

There are two to be won, plus valuable

runner-up prizes of cameras and kit, when you buy one of the new Paper Tiger printers from Dataproducts – the people who make printers for most of the world's major computer manufacturers.

## Dataproducts Paper Tiger

Nobody puts ideas on paper so many ways.

Dataproducts Limited, Retail Division, 136/138 High Street,  
Egham, Surrey TW20 9HL. Tel: (0784) 38733. Telex 298562.







## XIDEX PRECISION<sup>TM</sup> FLEXIBLE DISKS

The number-one quality floppy disk from Xidex – the world's leading polyester film coating specialists. Specially developed for high density applications with the highest certification level in the industry. 100% guaranteed and approved by leading manufacturers of microcomputers, word processors and disk drives.

Xidex – a new range of 5 1/4" and 8" disks, available from distributors throughout Europe.

For further details please telephone Xidex Magnetix on Colchester (0206) 564041.

**XIDEX**  
MAGNETICS

Xidex (UK) Ltd, Commerce Way, Colchester, Essex CO2 8XL  
Telephone: Colchester (0206) 564041 Telex 987104



# Gemini

## Integrated Accounting

### for the BBC Micro.

Designed for the small to medium sized business user, where speed and efficiency are vital, Gemini Integrated programs are suitable for sole traders, partnerships, or limited companies. All require a BBC B 32K microcomputer, and an 80 column printer.

A double disk drive with an Acorn compatible DFS is required for integrated accounting purposes. A single disk drive may be sufficient where modules are used independently, although this is not recommended for the Sales Ledger and Invoicing module. The manuals indicate the system capacities for various disk drive combinations.

### Why Integrated Accounting?

Because it will retrieve information stored in one program for use by another, and store data in one program which has been generated by another.

### Why Gemini?

Because our business software for the BBC Micro is based upon the solid foundation of experience. Not only are three of our Directors Chartered Accountants, but we have also successfully written business software for the BBC Micro since it was first launched.

### STOCK CONTROL

A program providing full control over every aspect of stockholding operations.

Inventory Master File holding details of part number, selling and cost price, sales and product code, current stock, location of stock, allocated items, re-order level, quantity on order, current period activity and supplier code.

Maximum 980 part numbers on 40 track disk and 1980 on 80 track disk per stock file.

**NO SECOND PROCESSOR REQUIRED!**

### INVOICING & SALES LEDGER

Produces invoices and statements for customers and enables a tight control over credit procedures to be maintained by producing aged debtor reports.

Automatic updating of sales ledger. Can hold up to 135 customers on 40 track disk system and up to 610 customers on 80 track disk system per Sales Ledger file.

Comprehensive analysis of invoices over unlimited, user definable sales codes.

**Price £99.95 per Module VAT inclusive**

### PAYROLL

Provides a full range of controls over the different aspects of Payroll Accounting including tax and other deductions. Employee file containing: Name, address, sex, marital status, National Insurance Number and contribution type, date of birth, personnel number, department, type, date of employment commenced, all applicable tax codes, whether week 1 or month 1 type (cash, cheque or salary transfer), PAYE reference number, previous name, bank details. Maximum 50/88 employees on 40 track single/dual disk system and 140/198 employees per Payroll file.

### NOMINAL LEDGER

This is the central module of the Integrated Accounting system and may also be used independently as a Cash Book or interfaced with the Sales and Purchase Ledgers and Payroll programs.

143 Nominal accounts all of which are user definable.

Full cash Book facilities.

Print out of full Trading and Profit and Loss Account and Balance Sheet together with notes to the accounts.

### PURCHASE LEDGER

Used independently or interfaced with the Gemini Nominal Ledger, the program maintains a complete file for each supplier, records amounts outstanding at any time, helps to determine which invoices are payable, and payment dates for the claiming of discounts.

Comprehensive analysis of invoices over unlimited, user definable expense headings. Maximum number of suppliers on 40 track disk system of 135 and maximum of 610 suppliers on 80 track disk system per Purchase Ledger file.

### Pre-Printed Stationery

The following Gemini two-part pre-printed continuous stationery forms are available by completing the order form in the manual: Invoices, Statements, Remittance Advices and Payslips.

### Available from:

Most good software dealers... or phone Gemini for immediate despatch quoting your Access, Visa or American Express card number. Telephone (0395) 265165/265832. Alternatively make your cheque or Postal Order payable to Gemini Marketing Ltd., and send to Gemini Marketing Ltd., 18a Littleham Road, Exmouth, Devon EX8 2QG.

**Please send urgently (specify 40 or 80 track)**

Prices stated in this brochure include VAT and Post and Packing (UK only).

Name .....

Address .....

Signature .....

Credit Card No. Access/Visa/American Express (delete) .....

PCW

The image shows a sample of a pre-printed stationery form, likely an invoice or statement. It features a header section for 'STATEMENT' and 'INVOICE TO'. Below this, there are fields for 'CUSTOMER NUMBER', 'ORDER NUMBER', and 'OUR REF.'. The main body of the form is a table with columns for 'ITEM', 'DESCRIPTION', 'PRICE', 'QTY', 'TAXES', and 'VALUE'. At the bottom, there are fields for 'SUB TOTAL', 'VAT', and 'TOTAL'. The form is designed to be printed on continuous stationery.



# Half a box is better than one?



**25 s/s d/d disks + box £29**  
plus VAT and P + P

**25 d/s d/d disks + box £39**  
plus VAT and P + P

We ran the advertisement opposite to move some stock left from a cancelled order. And move them it certainly did. We're still selling around 30 boxes a day, that's over 30,000 disks a month. So we bought some more, and are going to continue selling at the same price.

We also got a lot of people on the phone asking if we could supply slightly fewer disks, and as you see, we're now offering boxes in 25's as well.

Every order of 25 or 50 comes packed in the same rigid plastic storage box with four dividers, we've kept the same high specification and all disks carry our two for one guarantee.

To order, just clip the coupon below. Personal callers welcome.

We accept orders from all government bodies, schools, universities, libraries, armed forces etc. We despatch on receipt of an official purchase order.

If you can't raise a cheque without an invoice please post or telephone your order and we'll send you a proforma by return.

**Disco Technology Limited, Lex House, 3/6 Alfred Place,  
London WC1, England. Telephone 01-631 0255,**

**50 s/s d/d disks + box £50**  
plus VAT and P + P

**50 d/s d/d disks + box £75**  
plus VAT and P + P

**Take Advantage of us!**

50 s/s d/d disks + box - £50 plus VAT + p&p  
50 d/s d/d disks + box - £75 plus VAT + p&p

Disco-tek sells disks and accessories, we'll sell them to practically anyone, anywhere. So when we got a telephone order for a lot of storage boxes and disks we didn't waste any time and stocked up. Then the order was cancelled. So we're having to let them go at cost, in fact, less than cost.

For just £50 we can supply a rigid, high impact plastic storage box, with four dividers packed with 50 single-sided, double-density disks. The same storage box filled with 50 double-sided, double density disks will cost just £75. And all carrying our five year guarantee - if a disk is faulty send it back for two free replacements.

To order just clip the coupon below.

**To Disco-Technology Ltd,  
28 Orange Street,  
London WC2H 7ED**

Please rush me \_\_\_\_\_ qty storage boxes filled with 50 single-sided ☐  
50 double-sided ☐ disks at £59.50 or £87.25 respectively.  
(£2 already added for p&p and insurance) I enclose a cheque for £ \_\_\_\_\_  
or debit my Access card No. \_\_\_\_\_

Name \_\_\_\_\_ Signature \_\_\_\_\_  
Address \_\_\_\_\_  
Postcode \_\_\_\_\_ Telephone \_\_\_\_\_

**To Disco-Technology Ltd,  
28 Orange Street,  
London WC2H 7ED**

**DISCO-TEK**

© Certain Advertising Ltd 01-930 1612

Please rush me

- \_\_\_\_ (qty) storage box(es) filled with 50 s/sided disks at £59.50 each.
- \_\_\_\_ (qty) storage box(es) filled with 50 d/sided disks at £87.25 each.
- \_\_\_\_ (qty) storage box(es) filled with 25 s/sided disks at £33.65 each.
- \_\_\_\_ (qty) storage box(es) filled with 25 d/sided disks at £47.15 each.
- \_\_\_\_ (qty) empty storage box(es) at £11.

Prices include VAT and P + P. I enclose cheque for \_\_\_\_\_  
or debit my Access card no. \_\_\_\_\_

Name \_\_\_\_\_ Signature \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_ Telephone \_\_\_\_\_

**To: Disco Technology Ltd, Lex House, 3/6 Alfred Place, London WC1.**

**XLtron**



# BBC Micro Computer System OFFICIAL DEALER

## ACORN COMPUTER SYSTEMS:

|                                  |          |
|----------------------------------|----------|
| BBC Model B Special offer .....  | £320 (a) |
| BBC Model B + Econet .....       | £389 (a) |
| BBC Model B + DFS .....          | £409 (a) |
| BBC Model B + DFS + Econet ..... | £405 (a) |

## UPGRADE KITS:

|                          |         |
|--------------------------|---------|
| A to B Upgrade Kit ..... | £75 (c) |
| DFS Kit .....            | £95 (c) |
| Econet Kit .....         | £45 (c) |
| Speech Upgrade Kit ..... | £47 (c) |

## ACORN ADDON PRODUCTS:

|                          |            |
|--------------------------|------------|
| Z80 2nd Processor .....  | £265 (a)   |
| 6502 2nd Processor ..... | £175 (b)   |
| Teletext Adaptor .....   | £190 (b)   |
| IEEE Interface .....     | £282 (b)   |
| Prestel Adaptor .....    | £99 (b)    |
| RH Light pen .....       | £39.50 (c) |

## BBC FIRMWARE:

|                                    |            |
|------------------------------------|------------|
| 1.2 Operating System Rom .....     | £7.50 (d)  |
| BASIC II ROM .....                 | £22.50 (d) |
| VIEW Word Processor Rom .....      | £48 (c)    |
| Word Wise Word Processor Rom ..... | £34 (d)    |
| BCPL ROM/Disc .....                | £86 (c)    |

## UTILITY ROMS:

|                                       |            |
|---------------------------------------|------------|
| Disc Doctor/Gremlin Debug ROM .....   | £28 ea (d) |
| EXMON/TOOLKIT ROM .....               | £20 ea (d) |
| Printmaster (FX80)/Graphics ROM ..... | £28 ea (d) |
| ULTRACALC Spreadsheet ROM .....       | £69 ea (c) |

## COMMUNICATION ROMS:

|                      |         |
|----------------------|---------|
| Termi Emulator ..... | £28 (d) |
| Communicator .....   | £59 (d) |
| Commstar .....       | £29 (d) |

For detailed specification on any of the BBC Firmware/Peripherals listed here or information on our complete range please write to us.

# DISC DRIVES

These drives, fitted with high quality slim line Japanese mechanisms are supplied in attractive cases with BBC matching colour and come complete with data and power leads, manual and formatting disc. The 40/80T switching is supplied as standard on TEAC 80T drives. Single drives are supplied with or without power supply. All dual drives are supplied with integral switch mode power supply. TEAC & MITSUBISHI drives are compatible for both single and double density operation. These drives can also be used with any other micro with a Shugart A400 interface.

|                                            |          |                              |          |
|--------------------------------------------|----------|------------------------------|----------|
| 1 x 100KTS55A (40T) TEAC .....             | £120 (b) | CS55ATEC with PSU .....      | £135 (a) |
| 1 x 200KTS55E (40/80T) TEAC .....          | £160 (b) | CS55ETEC with PSU .....      | £175 (a) |
| 1 x 400KTS55F (40/80T) TEAC .....          | £198 (b) | CS55F MIT. with PSU .....    | £215 (a) |
| 2 x 100KTD55A (40T) TEAC with PSU .....    | £300 (a) | 40/80T Switch Module .....   | £30 (c)  |
| 2 x 200KTD55E (40/80T) TEAC with PSU ..... | £390 (a) | 3" Hitachi 100K Drive .....  | £120 (b) |
| 2 x 400KTD55F (40/80T) TEAC with PSU ..... | £420 (a) | TD55M (80T) Mitsubishi ..... | £420 (a) |

# DISCS & ACCESSORIES

The 3M discs with a life time warranty provide a reliable and error free performance at economical prices. Floppyclene head cleaning kit is an ideal way to ensure optimum performance of your drives.

|                                   |  |                                            |  |
|-----------------------------------|--|--------------------------------------------|--|
| 3M DISCS in packs of 10           |  | FLOPPICLENE Kit (20 disposable discs)      |  |
| 40T SSD £16 (c); 40T DSD £22 (c); |  | Drive Cables: Single £6.50 Dual £8.50 (d); |  |
| 80T SSD £24 (c); 80T DSD £27 (c); |  | 30/40 Disc Lockable Case £14.50 (c);       |  |
| 10 Disc Library Case £1.95 (c);   |  | 70/80 Disc Lockable Case £20 (c).          |  |
| 30 Disc Case £6 (c);              |  |                                            |  |
| 3" Maxell DS Disc £4.50 ea (d);   |  |                                            |  |

**ALL PRICES EXCLUDE VAT** Please add carriage 50p unless indicated as follows: (a) £8.00 (b) £2.50 (c) £1.50 (d) £1.00

# PRINTERS

Our wide range of printers offer a choice of printer for every requirement at competitive prices. We have the full EPSON range which sets the industry standards for reliability, flexibility and versatility. The new KAGA TAXAN range provides the NLQ printing fonts and other new exciting features. For those wanting the correspondence quality printing we have the BROTHER and JUKI printers. To support our range of printers we also carry a wide range of printer interfaces, accessories and consumables.

## EPSON: RX80FT £240 (a); FX80 £325

(a); FX 100 £480 (a);

KAGA TAXAN: KP 810 £269 (a); KP910

£369 (a);

BROTHER: HR15 £350 (a); EP44

£199 (a);

JUKI 6100 £359 (a).

3 Col Graphics Plotter/Work Stn £490 (a)

3 Col Graphics Plotter ..... only £270 (a)

Grafpad Graphics Tablet ..... £120 (b)

# ACCESSORIES

EPSON Serial interface: 8143 £35 (b); 8148 with 2K buffer £50 (b).

EPSON Paper Roll Holder £17 (b); FX80 Tractor Attach. £37 (b); RX/FX80 Dust Cover £4.50 (d).

EPSON Ribbons: MX/RX/FX80 £6.50; MX/RX/FX100 £12.50 (d).

JUKI: Serial Interface £60 (a); Tractor Attach. £99 (a); Sheet Feeder £199 (a); Ribbon £2.50 (a).

BROTHER HR15: Sheet Feed £199; Ribbons — Carbon or Nylon £3; Multistrike £5.50 (d); 2000 Sheets Fanfold with extra fine perf. 9.5" £13.50; 15" £17.50 (b).

BBC Parallel Lead £8; Serial Lead £7 (d).

## 'TIME-WARP'

### BBC REAL-TIME-CLOCK/CALENDAR

A low cost unit that opens up the total range of Real-Time applications. With its full battery backup, possibilities include an Electronic Diary automatic document dating precise timing & control in scientific applications, recreational use in games. Its uses are endless and are simply limited by one's imagination. Simply plugs into the user port — no specialist installation required — No ROMS. Supplied with extensive applications software ..... £29.00

## TORCH Z80 PACK

The proven Z80/CPM upgrade for the BBC with Z80 CPU/64K RAM/CPM ROM 2 x 400K Disc Drive and PERFECT software package — £675 (a); ZEP100 Z80 CPU/64K RAM/CPM ROM & PERFECT software package — £290 (a); Torch UNICOM Communications Package — £161 (b). GRADUATE The card to convert your BBC into an IBM PC. To be available early September. Send for details.

# MONITORS

## COLOUR GREEN MONITORS (leads inc'd)

|                                            |          |
|--------------------------------------------|----------|
| Microvitec 1431 14" RGB Std Res .....      | £195.00a |
| Microvitec 1431 14" RGB/PAL + sound .....  | £215.00a |
| Microvitec 1451 14" RGB Med Res .....      | £295.00a |
| Microvitec 1441 14" RGB Hi Res .....       | £339.00a |
| Microvitec 2031 20" RGB Std Res .....      | £360.00a |
| KAGA Vision II Hi Res .....                | £260.00a |
| KAGA Vision III 12" RGB Super Hi Res ..... | £358.00a |
| KAGA 12" Green Hi Res .....                | £108.00a |
| SANYO DM8112CX 12" Green Hi Res .....      | £99.00a  |
| KAGA RGB Lead .....                        | £6.50d   |
| BNC Green Screen Monitor Lead .....        | £3.00d   |
| Heavy duty monitor plinth for BBC .....    | £13.50b  |
| Two tier metal plinth .....                | £19.50b  |
| Microvitec plinth .....                    | £8.50b   |
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Please phone for further details

# CONNECTOR SYSTEMS

## I.D. CONNECTORS

### (Speed Block Type)

| St. Pin     | Receptacles | Edge Conn. |
|-------------|-------------|------------|
| 10 way 90p  | 85p         | 120p       |
| 20 way 145p | 125p        | 195p       |
| 26 way 175p | 150p        | 240p       |
| 34 way 200p | 160p        | 320p       |
| 40 way 220p | 190p        | 340p       |
| 50 way 235p | 200p        | 390p       |

## D CONNECTORS

### MALE No. of Ways

|             |      |      |      |
|-------------|------|------|------|
| Solder 80p  | 105p | 160p | 250p |
| Angled 150p | 210p | 250p | 365p |

### FEMALE

|             |      |      |      |
|-------------|------|------|------|
| Solder 105p | 160p | 200p | 355p |
| Angled 165p | 215p | 290p | 440p |
| Hoods 90p   | 85p  | 90p  | 100p |

### IDC 15 way Plug 340p Socket 400p

### IDC 25 way plug 385p Socket 450p

## TEST CLIPS

|               |             |
|---------------|-------------|
| 14 pin 375p   | 16 pin 400p |
| 40 pin 40 pin | £10.30      |

## TEXTOL ZIF SOCKETS

|         |        |
|---------|--------|
| 2532    | 350p   |
| 2732    | 350p   |
| 2764-25 | 500p   |
| 27128-3 | £15.00 |
| 4164-2  | 450p   |

## DIL SWITCHES

|        |      |
|--------|------|
| 4 way  | 70p  |
| 6 way  | 100p |
| 8 way  | 130p |
| 10 way | 150p |

## BAUD RATE GENERATORS

|         |      |
|---------|------|
| MC14411 | 900p |
| COM8116 | 800p |
| 4702B   | 750p |

## JUMPER LEADS

### 24" Ribbon Cable with Headers

|            | 14pin | 16pin | 24pin | 40pin |
|------------|-------|-------|-------|-------|
| Single     | 145p  | 165p  | 240p  | 380p  |
| End Double | 210p  | 230p  | 345p  | 540p  |

### Ribbon Cable with Sockets

|        | 20 pin | 26 pin | 34 pin | 40 pin |
|--------|--------|--------|--------|--------|
| 1 end  | 160p   | 200p   | 280p   | 300p   |
| 2 ends | 290p   | 370p   | 480p   | 525p   |

## RS 232 CONNS

### (25 way D)

|                             |       |
|-----------------------------|-------|
| 24" Single end Male .....   | £5    |
| 24" Single end Female ..... | £5.25 |
| 24" Female-Female .....     | £10   |
| 24" Male-Male .....         | £9.50 |
| 24" Male-Female .....       | £9.50 |

## DIP HEADERS

|        | Solder | IDC  |
|--------|--------|------|
| Type   | Type   | Type |
| 14 pin | 40p    | 120p |
| 16 pin | 50p    | 140p |
| 24 pin | 100p   | 200p |
| 40 pin | 200p   | 225p |

## AMPHENOL CONNECTORS

|                          |              |              |
|--------------------------|--------------|--------------|
| 36 way plug Centronics   | Solder £5.25 | IDC £5.25    |
| 36 way socket Centronics | Solder £5.50 | IDC £5.50    |
| 24 way plug IEEE         | Solder £5.00 | IDC £4.75    |
| 24 way socket IEEE       | Solder £5.00 | IDC £4.75    |
| PCB Mtg Skt Ang pin      | 24 way £6.00 | 36 way £6.50 |

## RIBBON CABLE

|        | (Grey/meter) |
|--------|--------------|
| 10 way | 40p          |
| 16 way | 60p          |
| 20 way | 85p          |
| 26 way | 120p         |
| 34 way | 160p         |
| 40 way | 180p         |
| 50 way | 200p         |
| 64 way | 280p         |

## EUROCONNECTORS

| DIN 41617                                            | PLUG | SKT  |
|------------------------------------------------------|------|------|
| 21 way                                               | 160p | 165p |
| 31 way                                               | 170p | 170p |
| DIN 41612                                            |      |      |
| 2 x 32 way St Pin                                    | 230p | 275p |
| 2 x 32 way Ang Pin                                   | 275p | 320p |
| 3 x 32 way St Pin                                    | 260p | 300p |
| 3 x 32 way Ang Pin                                   | 375p | 400p |
| 1 DC Skt A + B                                       | 275p |      |
| A + C                                                | 300p |      |
| For 2 x 32 way please specify spacing (A + B, A + C) |      |      |

## EDGE CONNECTORS

|                                  | 0.1" | 0.156" |
|----------------------------------|------|--------|
| 2 x 6 way (Commodore)            | —    | 300p   |
| 2 x 10 way (Commodore)           | 150p | —      |
| 2 x 12 way (Vic 20)              | —    | 350p   |
| 2 x 18 way                       | —    | 140p   |
| 2 x 23 way (ZX81)                | 175p | 220p   |
| 2 x 25 way 2 x 28 way (Spectrum) | 225p | 220p   |
| 2 x 36 way                       | 200p | —      |
| 1 x 43 way                       | 250p | —      |
| 2 x 43 way                       | 260p | —      |
| 2 x 43 way                       | 190p | —      |
| 1 x 77 way                       | 395p | —      |
| 2 x 50 way (S100conn)            | 400p | 500p   |
|                                  | 600p | —      |

## CPUs

|          |      |
|----------|------|
| 1802CE   | 650p |
| 2650A    | £12  |
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| 6502A    | 650p |
| 6800     | 290p |
| 6802     | 300p |
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| 68B09E   | £16  |
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| 8039     | £12  |
| 8080A    | 450p |
| 8085A    | £18  |
| 8086     | £22  |
| 8088     | £22  |
| 8748     | £45  |

## SUPPORT DEVICES

|               |        |
|---------------|--------|
| TMS 1601      | £12    |
| TMS9980       | £12    |
| TMS9995       | £12    |
| WD55          | £14.50 |
| Z80           | 300p   |
| Z80A          | 400p   |
| Z80B          | 750p   |
| 8255A         | £12    |
| 8255AC-5      | £25    |
| 8255          | £27    |
| 8288D         | £11    |
| Z80P10        | 300p   |
| Z80AP10       | 350p   |
| Z80CTC        | 300p   |
| Z80ACTC       | 350p   |
| Z80DART       | 700p   |
| Z80ADART      | 850p   |
| Z80ACTC       | 350p   |
| Z80AS10-0/2/9 | 900p   |

## COMPONENTS

|               |      |                      |        |
|---------------|------|----------------------|--------|
| 6875          | 750p | TMS9901              | 500p   |
| 8205          | 225p | TMS9903              | £25    |
| 8212          | £11  | TMS9911              | £18    |
| 8216          | 300p | TMS9914              | £14.00 |
| 8224          | 300p | Z80AS10-0/1/2/9 900p |        |
| 8250          | £18  |                      |        |
| 8251A         | £18  |                      |        |
| 8255AC-5      | £19  | CRT6545              | 900p   |
| 8256          | £25  | CRT5027              | £18    |
| 8279          | £11  | CRT5037              | £18    |
| 8288D         | £11  | EF9365               | £24    |
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| Z80AP10       | 350p | MC6845               | 650p   |
| Z80CTC        | 300p | MC6847               | 650p   |
| Z80ACTC       | 350p | TMS9927              | £18    |
| Z80DART       | 700p | TMS9928              | £20    |
| Z80ADART      | 850p | TMS9929              | £16    |
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| Z80AS10-0/2/9 | 900p | SFF96364             | 800p   |

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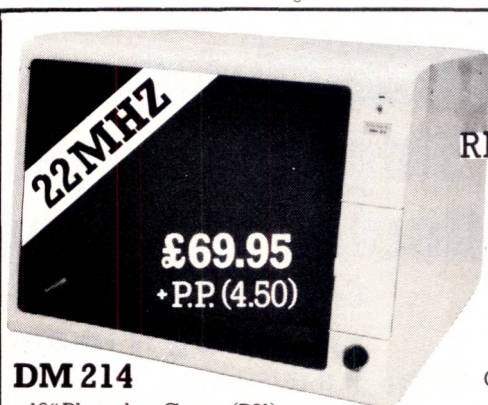
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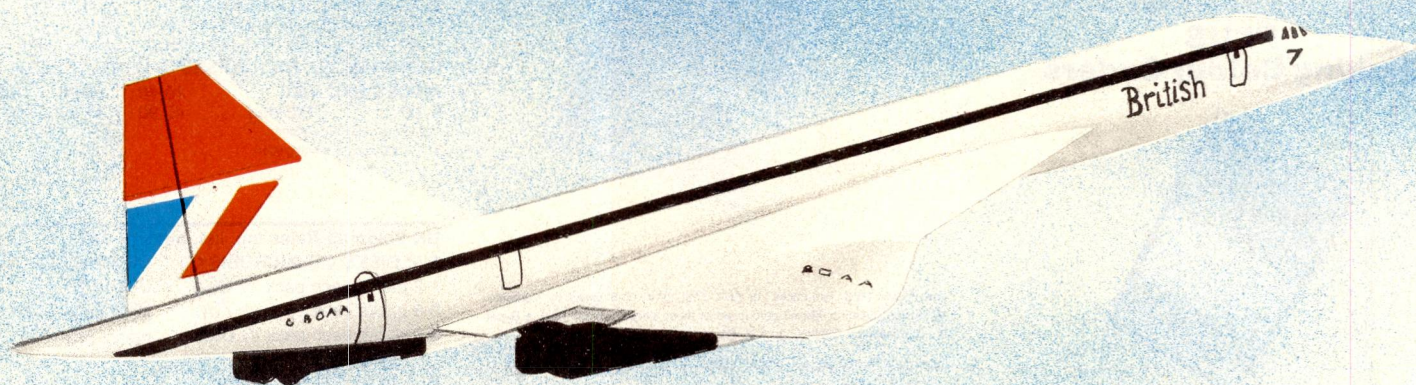




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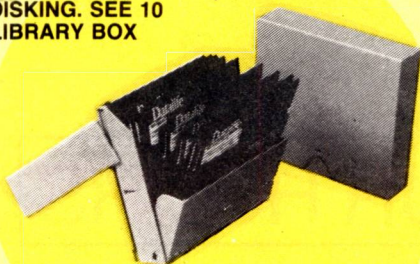


# DISKING NEWS

Will we ever learn?

We were buying some equipment the other day, and were having it checked out through the lunch hour as the engineer concerned knew we were in a hurry. Needing assistance he gave a lady colleague another unit to test. She happily complied, and was busy when a sloppy looking male individual entered the room. This very cocky young man had been wandering around the factory most of the morning, doing nothing apart from embarrassing us all with filthy jokes in very bad taste. He now confronted the lady and told her that under NO circumstances

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should she be there after 1 o'clock and that her lunch hour was NOT for working. She was too embarrassed to argue, and walked out to keep him quiet, leaving the unit under test. Just another customer's unit. Just another customer. Just the hand that fed him. "Another pint John?"

As promised last month, the NEW Microdisk SEE 10 has arrived, and is FREE with every pack of ten MEMOREX 6100 Microdisks, or Maxell CF2 microdisks. It is also available separately at £2.50 EXC VAT. The fabulous NEW MEMOREX cleaning kits, have also arrived and at these prices give you NO excuses not to own one. We still ship the world's best diskettes faster than anybody, we always enclose a VAT invoice and current price list. If we can't ship within four working hours (YES HOURS) we'll ship a more expensive alternative equivalent at OUR Expense!

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\*Excluding diskettes purchased from bargain corner. All FREE offers are subject to availability.

# MEMOREX



## MEMORY EXCELLENCE

Memorex diskettes are everyone's favourite, and work well in ALL computer systems.

### 5 1/4" INCH DISKETTES

Certified for single OR double density and with hub ring reinforcement

| PRICES EXC VAT  | 10-40 | 50-90 | 100+  |
|-----------------|-------|-------|-------|
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48 tpi suitable for 35 or 40 track operation

96 tpi suitable for 77 or 80 track operation

10 and 16 Hard Sector available at same prices

### MEMOREX 3 1/2" MICRODISKS — HERE AT LAST!

| PRICES EXC VAT | 10-40 | 50-90 | 100+  |
|----------------|-------|-------|-------|
| 6100 S/Sided   | 42.90 | 41.90 | 40.90 |

0.5M Byte rating auto shutter

3 1/2" library boxes coming soon

### UK Shipping Rates inc. ins. but exc VAT

| 5 1/4" DISKS OR MICRODISKS | DISKING COLOUR CODERS |
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| 1-2 packs each pack 17 95p | 25p each — 5+         |
| 3-5 packs each pack @ 75p  | POST FREE             |
| 6-9 packs each pack @ 60p  |                       |
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| 1 off 60p each             |                       |
| 2-7 off 40p each           |                       |
| 8+ off POST FREE           |                       |

# DISKING

## Means Business

## Diskette Storage

### NEW Memorex Cleaning Kits

Just arrived are the MEMOREX Computer Care range of cleaning kits. They represent fantastic value for money, and are available individually or with a discount if purchasing all three.

| Part. No | Description                                                                             | Price |
|----------|-----------------------------------------------------------------------------------------|-------|
| MKEY     | Case & Keyboard Cleaning Kit with one foam-clean aerosol, 20 Safe-buds & 5 Safecloths   | 4.90  |
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Buy all three Kits together and we will reduce the total price from £18.70 to £14.90 — A Bargain if ever we saw one!



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A massive 120 Minidisk capacity! With adjustable arms to compensate for less diskettes, keys and carrying handle. Buy 3 and STEAL one FREE.



| Part No. | Description           | 1-3   |
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| JUMBO    | 120 Minidisk capacity | 18.90 |

Buy 3 and STEAL one FREE. P&P at the four unit rate please.

### Budget 30

30 Minidisk capacity, smart beige/brown with strong steel hinges complete with 5 coloured dividers. Buy 3 and STEAL one FREE.



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### Executive Mini 100 & Executive Micro 50

The ultimate in quality, these beautiful Austrian made storage boxes in luxurious two tone dark brown come with everything one could ever want. The lids not only swing open and shut, but are also removable if shelf space is prohibitive. They come with ingenious dividers where even the tabs are adjustable and protected from dirty finger marks. The wonderfully engineered locking mechanism comes with 2 keys and a master filing tab. Buy 3 and STEAL one FREE.



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|----------|-----------------------|-------|
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### Disking Swing-Ild Lockable Box

60 Minidisk capacity, complete with keys, dividers, tags and even built in carrying handles. Buy 3 and STEAL one FREE.



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|----------|----------------------|-------|
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# Dysan



## DYSAN — FOR THE DISCERNING

With new lower prices, Dysans impeccable reputation is now a genuine bargain

### 5¼ INCH DISKETTES

Certified for Single OR Double Density. 48 tpi with Hub Ring reinforcement

| PRICES EXC VAT        | 10-40 | 50-90 | 100+  |
|-----------------------|-------|-------|-------|
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| 104/2D D/S 48 tpi ... | 34.90 | 33.90 | 32.90 |
| 204/1D S/S 96 tpi ... | 34.90 | 33.90 | 32.90 |
| 204/2D D/S 96 tpi ... | 42.90 | 41.90 | 40.90 |

48 tpi suitable for 35 or 40 track operation

96 tpi suitable for 77 or 80 track operation

10 and 16 Hard Sector available at same prices

### 8 INCH DISKETTES

| PRICES EXC VAT         | 10-40 | 50-90 | 100+  |
|------------------------|-------|-------|-------|
| 3740/1D S/S D/Dens ... | 32.90 | 31.90 | 30.90 |
| 3740/2D D/S D/Dens ... | 40.90 | 39.90 | 38.90 |

32 Hard Sector available at same prices

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## MAXELL — THE GOLD STANDARD

Maxell's very high quality control ensures all standards are met and surpassed

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Certified for Single OR Double Density. 48 tpi with hub ring reinforcement

| PRICES EXC VAT          | 10-40 | 50-90 | 100+  |
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| MD1-D S/S 48 tpi ...    | 24.90 | 23.90 | 22.90 |
| MD2-D D/S 48 tpi ...    | 32.90 | 31.90 | 30.90 |
| MD1-DD S/S 96 tpi ...   | 32.90 | 31.90 | 30.90 |
| MD2-DD D/S 96 tpi ...   | 42.90 | 41.90 | 40.90 |
| MD2-HD D/S 1.6MByte ... | 59.00 | 56.00 | 53.00 |

48 tpi suitable for 35 or 40 track operation

96 tpi suitable for 77 or 80 track operation

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| PRICES EXC VAT         | 10-40 | 50-90 | 100+  |
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| FD1-1XD S/S D/Dens ... | 34.90 | 33.90 | 32.90 |
| FD2-XDD D/S D/Dens ... | 39.90 | 38.90 | 37.90 |

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| PRICES EXC VAT          | 10-40 | 50-90 | 100+  |
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48 tpi suitable for 35 or 40 track operation

96 tpi suitable for 77 or 80 track operation

10 & 16 Hard Sector available at same prices

### 8 INCH DISKETTES

| PRICES EXC VAT           | 10-40 | 50-90 | 100+  |
|--------------------------|-------|-------|-------|
| FD32-9000 S/S S/Dens ... | 31.90 | 30.90 | 29.90 |
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| DD34-4001 D/S D/Dens ... | 36.90 | 35.90 | 34.90 |

### DISKETTE STORAGE

#### Budget 30

1 off 1.00 each

2-7 off 70p each

8+ off POST FREE

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Part No:

Prices exc VAT

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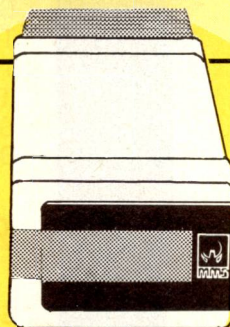
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How to Contact DISKING:- By Telephone (0428) 722563

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You may call 365 days a year, 24 hours a day and you may speak for as long as you like, when you leave the following details:-

- 1 Day-time telephone number
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we welcome Access (Mastercharge), Barclaycard (VISA) and Diners Club International, and there is NO credit card surcharge. Alternatively you may write your C/card No. on your order

You may leave the rest to US!!

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If you're posting your order, omit the word FREEPOST from our address, and use our normal post code GU30 7EJ and do not forget to stamp it First Class. If you are telephoning your order please make it clear that you wish to pay for your goods to be sent to you by First Class Post

### FIRST CLASS RATES

| EXC VAT                     | 5¼"  | 8"   |
|-----------------------------|------|------|
| First Ten-Pack              | 2.00 | 2.50 |
| 2nd and subsequent Ten-Pack | 1.50 | 2.00 |

## TRADE CORNER FREE AEROPLANE

Our latest aeroplanes now have sound! Ideal missiles for throwing across the office at sleeping software engineers. Call and ask for your flier, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette. We'll also enclose a DPC application form telling you how to buy at our 10,000 prices yet order in 50's.

## BARGAIN CORNER

5¼" Diskettes supplied in a FREE SEE 10 library box

| Prices Exc VAT              | 10-40 | 50-90 | 100+  |
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| UL/1D S/S 48 tpi Diskettes  | 13.90 | 12.90 | 11.90 |
| UL/2D D/S 48 tpi Diskettes  | 20.90 | 19.90 | 18.90 |
| UL/1DD S/S 96 tpi Diskettes | 20.90 | 19.90 | 18.90 |
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Don't be fooled — fully warranted, new and individually certified AND with a FREE SEE 10 library box and Disking Colour Coders!! They are unlabelled non-hub ring diskettes, and are manufactured by one of our four major suppliers. At these prices you can't lose. Don't forget you even get the superb DISKING clock with every two ten-packs.

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Sub Total exc VAT

VAT

Value of cheque payable to Disking

NAME:

ADDRESS:

TEL NO:

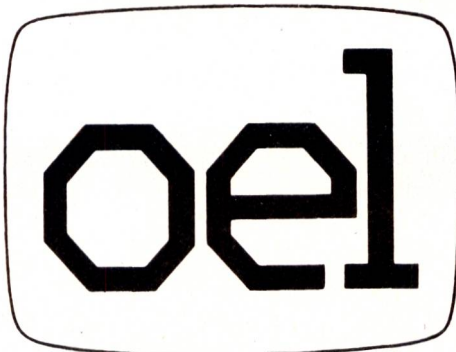
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PCW 9/84





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conditions of the instruction for use.

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### EVERYTHING'S REMOTELY POSSIBLE .....

Prestel & Micronet, BT Gold, User to User.

This modem converts your micro into a Communications Terminal. Viewdata Comms Pack contains Software, interface cards and connectors. Software downloads programs. Save frame, view frame, and print feature.

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FOR THE CBM 64. For use with compatible modem. Viewdata frame, Off-line Mailbox Edit Line-drop. User to User Software.



### MULTI-STANDARD MODEM

Your Gateway to:- Prestel/Micronet/Homelink/B.T. Gold  
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- ★ Operate your own Bulletin Board.
- ★ Direct Coupled with extension socket for the phone.
- ★ Auto/Manual Answer.
- ★ Data Standard CCITT V24.

## Telemod 3

**£175.00**

APPROVED for use  
with telecommunication systems run  
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accordance with the conditions in  
the instruction for use.

**All prices  
exclude VAT  
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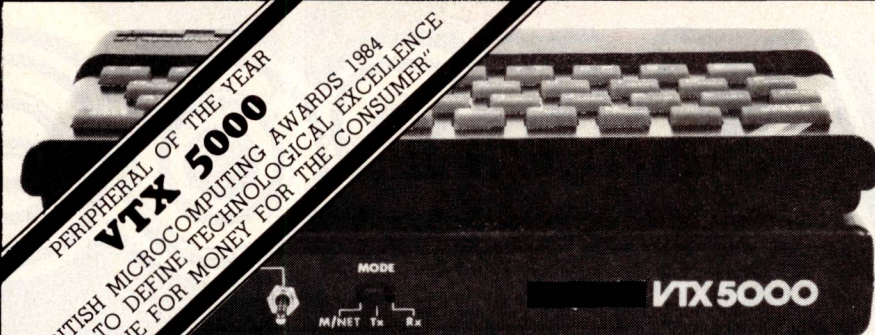


BRITAIN'S No. 1 MICROCOMPUTING SHOW  
**19-23 SEPTEMBER 1984  
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Sponsored by Personal Computer World

**STAND 644**



PERIPHERAL OF THE YEAR  
**VTX 5000**  
 BRITISH MICROCOMPUTING AWARDS 1984  
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Exclusively for the ZX Spectrum, the **£86.91**  
 VTX 5000 Modem operates at 1200/75 Baud  
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(User to User  
 Software available  
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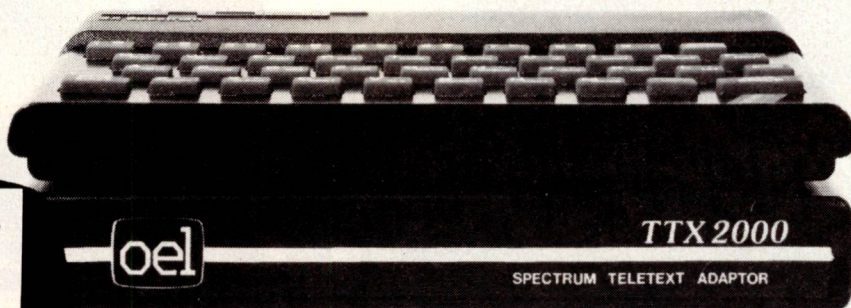
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**CBM 64  
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**AVAILABLE SOON!**

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**£125.00**

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| GRAND TOTAL |             |       |          |       |

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PLEASE ALLOW UP TO  
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- ☐ Please enclose a Prestel/Micronet membership form with my order.  
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**Also available on  
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Now No. 1 BBC  
game on Micro Deal  
Top Fifty chart

# YOU can go for gold ...with the **MICRO OLYMPICS**

Fancy pitting yourself against the world's best at this summer's Olympics?

You can do so without going anywhere near Los Angeles — with the most challenging package of programs of 1984.

MICRO OLYMPICS is more than a game. It's a brilliantly written collection of ELEVEN track and field events.

And because we know we're going to sell many thousands of them we've brought the price right down — to just £5.95.

Ever imagined yourself as another Seb Coe? Then try to run against the world record holder at 1500 metres. And if that distance is too much for you then there's always the 100, 200, 400 and 800 metres to have a go at.

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Yes, it's fast, furious fun, pitting yourself against the world's best times and distances on your micro.

You may not be another Steve Ovett or Alan Wells, but with practice you **COULD** become the Micro Olympics Champion!



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**Play Micro Olympics  
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do the running!**

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Please send me \_\_\_\_\_ copy/copies of  
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☐ I enclose cheque made payable to  
Database Publications Ltd.  
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|                                            |       |
|--------------------------------------------|-------|
| <input type="checkbox"/> BBC 'B' cassette  | £5.95 |
| <input type="checkbox"/> Electron cassette | £5.95 |
| <input type="checkbox"/> BBC 40-track disc | £7.95 |
| <input type="checkbox"/> BBC 80-track disc | £7.95 |

Please tick box

I wish to pay by  
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Signed \_\_\_\_\_

Name \_\_\_\_\_

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Post to: Micro Olympics offer, Database Publications,  
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# Just think what your computer could do with a photographic memory.



Your standard IBM PC or XT can be transformed into a graphics design workstation and slide production unit with Presentation Master, for only £1,495.00 plus VAT.

You cut the cost of producing 35mm colour slides from pounds to pence; the time from days to minutes.

## A powerful new business tool

Now your presentations can be added to, or slide contents changed, at a moment's notice. Copy sets and replacements can be generated in minutes. And all your confidential data stays where it is most secure, in your own office.

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Powerful design tools are provided in the form of DR DRAW and DR GRAPH. You choose to design slides using combinations of graphs, text and symbols, or create drawings freehand.

Quickly and simply, using English language not computer codes or cryptic messages, you create the slides you need.

A "Teach Yourself" program shows you how easy the system is to use and comprehensive readable manuals are supplied for reference.

When satisfied with your design on screen you can file it on disk or process it into a 35mm slide or instant print at the touch of a button.

From completion of design to ready to use

slide, this whole production process takes less than 3 minutes per slide.

## A complete system

Presentation Master combines advanced computer graphics software with the latest Polaroid photographic technology. Everything you need to design and produce 35mm slides and instant 3 1/4" x 4 1/4" prints is provided in one package.

## What you get

### Software:

DR DRAW for creation of almost any combination of lines, shapes and text to produce annotated diagrams, flow charts, etc. DR GRAPH takes data from the keyboard or popular electronic spreadsheets (VisiCalc, Lotus 1,2,3, SuperCalc and Multiplan) and produces annotated graphs of almost any description. Both programs use Digital Research GSX technology, so slide picture resolution is approximately 4 times better than the screen presentation.

### Photographic equipment:

An Image Recorder unit which connects to the IBM by a plug-in cable. Two cameras, a Minolta 35mm with autowinder for colour slide production and a Polaroid Instant Print for colour print production. A 35mm Autoprocessor for 2 minute development of transparency film. A Slide Mounter which cuts the film and loads it into slide mounts.

All of this equipment takes up less space than a shoebox on your desk.

A starter pack of films, slide mounts and camera batteries is also included with tutorial software and instruction manuals.

Presentation Master is available now from the authorised dealers listed opposite this advertisement. The price of the total system is £1,495.00 plus VAT, which includes a 12 month warranty.

Presentation Master's photographic memory makes sense on cost, speed and flexibility. Order yours today.



## Presentation Master

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We make computers work.™

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**NEW**

# CONTROL 'C'

## DATABASE GENERATOR

**AVAILABLE ON:**

**BBC**      **APPLE IIe**  
**APRICOT**      **AMSTRAD**  
**IBM**      **SIRIUS**

**CONTROL 'C'** database generator leads the field in business software. It puts you in total control of your system. In only a few hours without expertise or experience you can create professional programs, tailored to your needs.

**CONTROL 'C'** produces files and reports with real time updates; letter and label formats and bar-charts with full colour graphics. All these are totally integrated and can be altered with ease as your needs change. An equivalent suite of programs designed by an expert programmer would take weeks to produce and cost you £1000s.

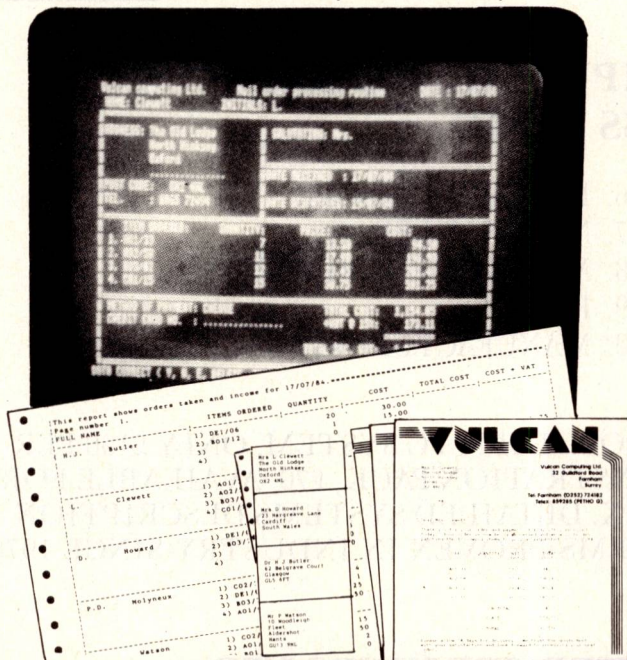
**CONTROL 'C'** is flexible, easy to use and very fast.

**IT IS QUICK TO LEARN** A person with no knowledge of programming can produce his first screen and file with full editing facility and together with a selective printed report from that file in under 2 hours. (Our guinea pig took 1 hour 25 minutes). The second file, screen and report will take under ½ hour (our guinea pig took 27 minutes). It is very logical in its approach, there are full prompts at every step. It is not necessary to learn any new concepts or any additional programming commands. The tutorial and manual are easy to follow, taking you step by step through the procedures. You will have total mastery of **CONTROL 'C'** within a few hours.

**IT IS FAST TO USE** The completed suite of programmes are simple for the operator to understand. Each routine can be selected from a menu with full prompts at every stage, one 30 minute session can teach a new operator how to run the system. Users can then input new records, amend records (with automatic updating of calculated fields) or delete records very rapidly and save the data in a fraction of a second. They can edit letters and print out general reports, individual letters to customers, labels or selective reports of all records meeting chosen criteria. And then create bar charts of any combination from the information on file. And the speed at which it fulfils this function is comparable, if not better than the typical speed of large supermicros or mini computers running under BASIC.

### IN 38 MINUTES WE PRODUCED

- ★ A screen for inputting new data and updating a file
- ★ A report itemising total daily input and stock levels
- ★ Labels for each order processed today
- ★ A letter for each customer processed today



### An Experienced Programmer

will appreciate how the generator will save days or even weeks in producing a system - creating all the files and file maintenance routines together with the printouts required in a fraction of the time previously needed. It will eliminate the need for complex testing and will result in a standardised package with a very professional appearance which would sell at a substantial price. (One of our programmers built a suite of programmes for a client using the generator and charged £800 for it. It took him less than 1 day to produce!).

### A Beginner to Programming

will now be able to tackle complex programming tasks himself. Whereas, previously a set of programs necessary to build and maintain a set of records on a file and print selected reports using BASIC might have taken several weeks hard work and then STILL have had bugs in it, the generator will be able to complete this task in an hour or two. Now the beginner can be certain that programming will be fast and completely reliable. When he decides to computerise more procedures he will be able to build onto his existing database system.

## FEATURES OF CONTROL 'C'

- ★ A full screen and file generator with 'screen based' definitions - the next generation from the standard 'menu driven' databases. It is very easy to add to, delete from or change a generated screen.
- ★ Record size is only limited by size of memory, typically in excess of 3000 bytes.
- ★ Files can be easily restructured, enlarged or shrunk without corruption of existing data.
- ★ Number of records per file is only limited by size of disc storage.
- ★ Each file can contain as many key fields as you like; you can sort in any combination of fields for creating new files, printing reports, letters, labels, screens or bar charts.
- ★ A full report generator with letter writing, complex Mail Merge and word processing facilities. Label printing
- ★ File definition listings with full data dictionary on all fields in all files. Enables the programmer to access the data easily when building additional routines.
- ★ Can use colour, sound and graphics where available on the computer. Full set up routine to configure your database to any printer.
- ★ Select drive for programs and for data; read disc directory, copy, delete, rename a file all within the generator.
- ★ Can implement all function keys where available into generated programs.
- ★ Very fast in use - on most computers a screen with 40 prompts saves and clears in under 1 second.
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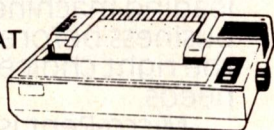
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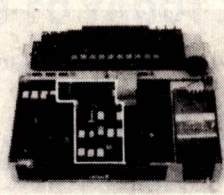
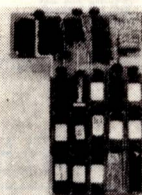
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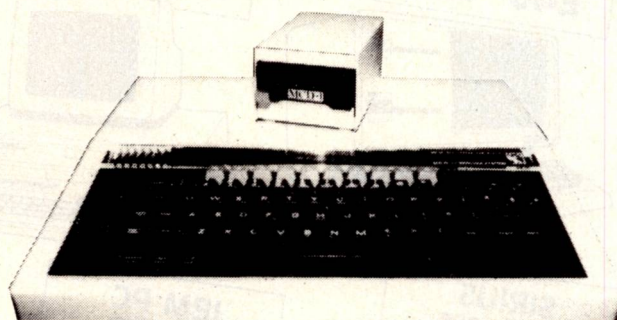
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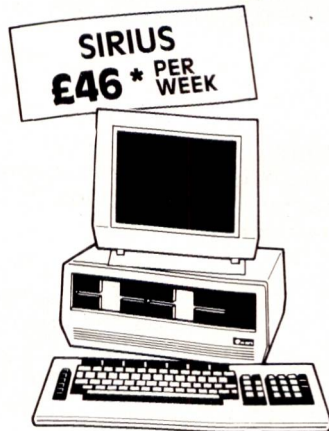
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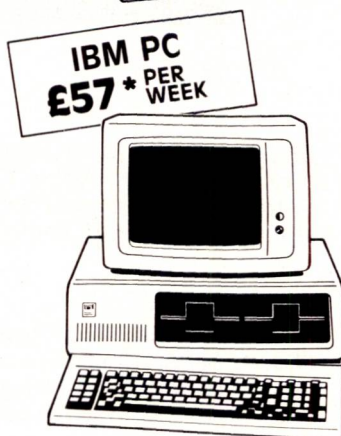
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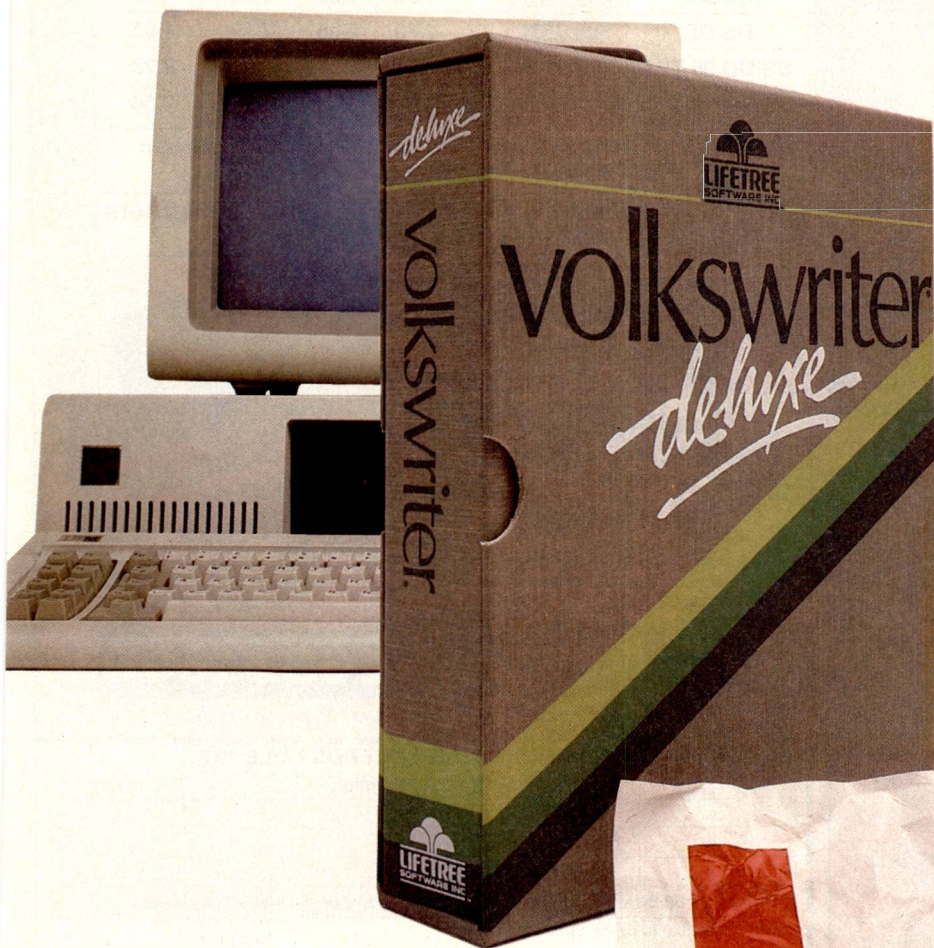
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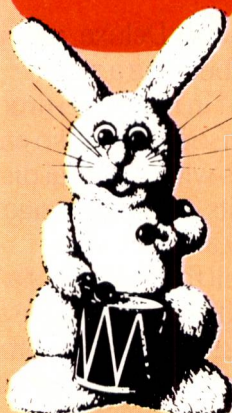
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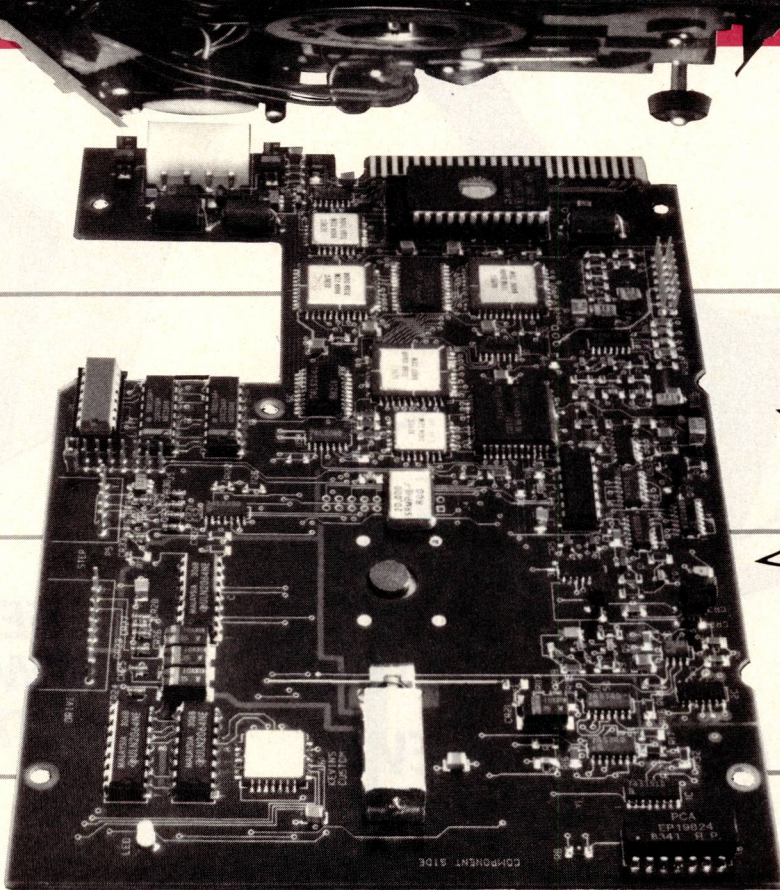
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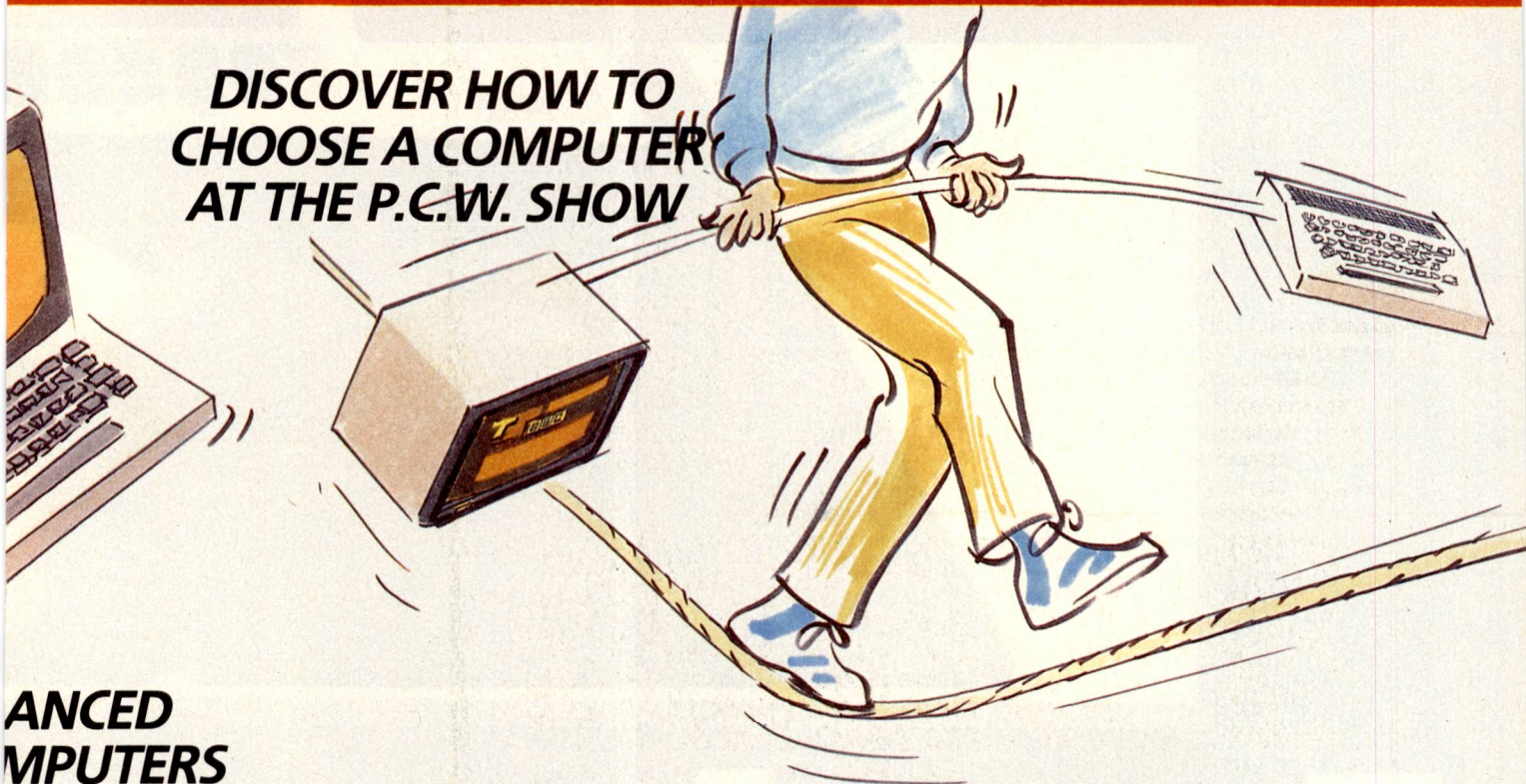
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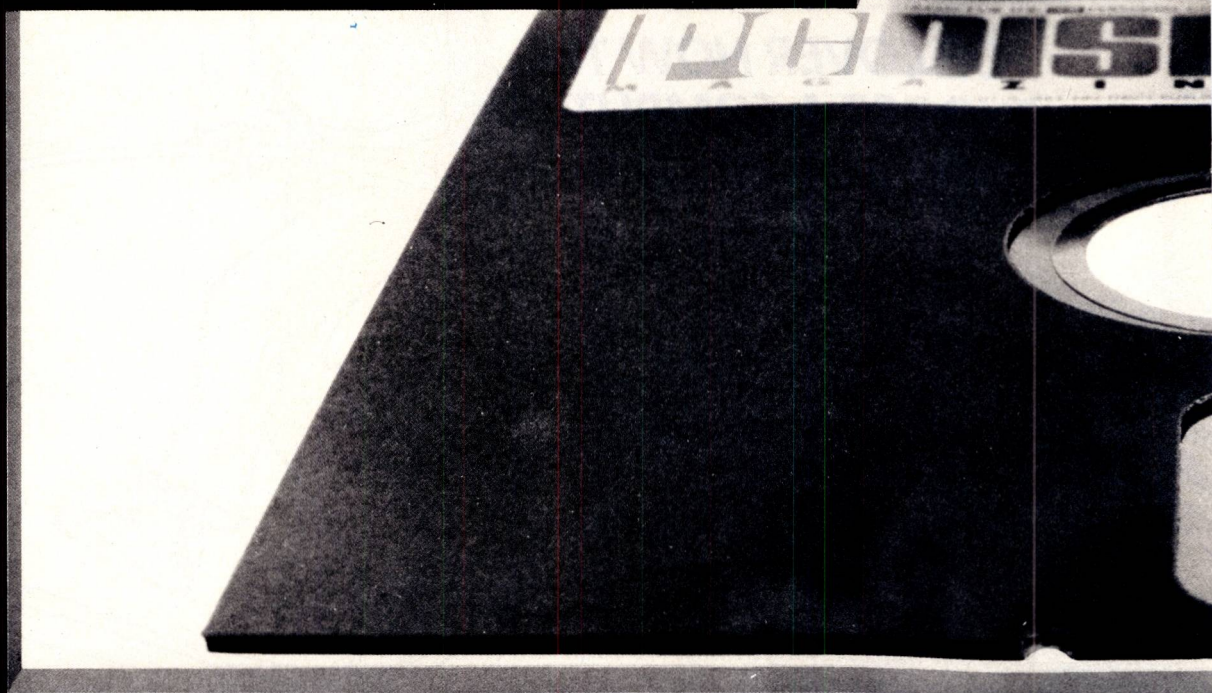
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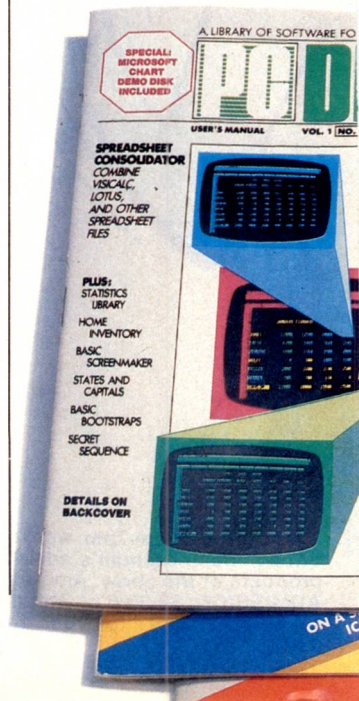
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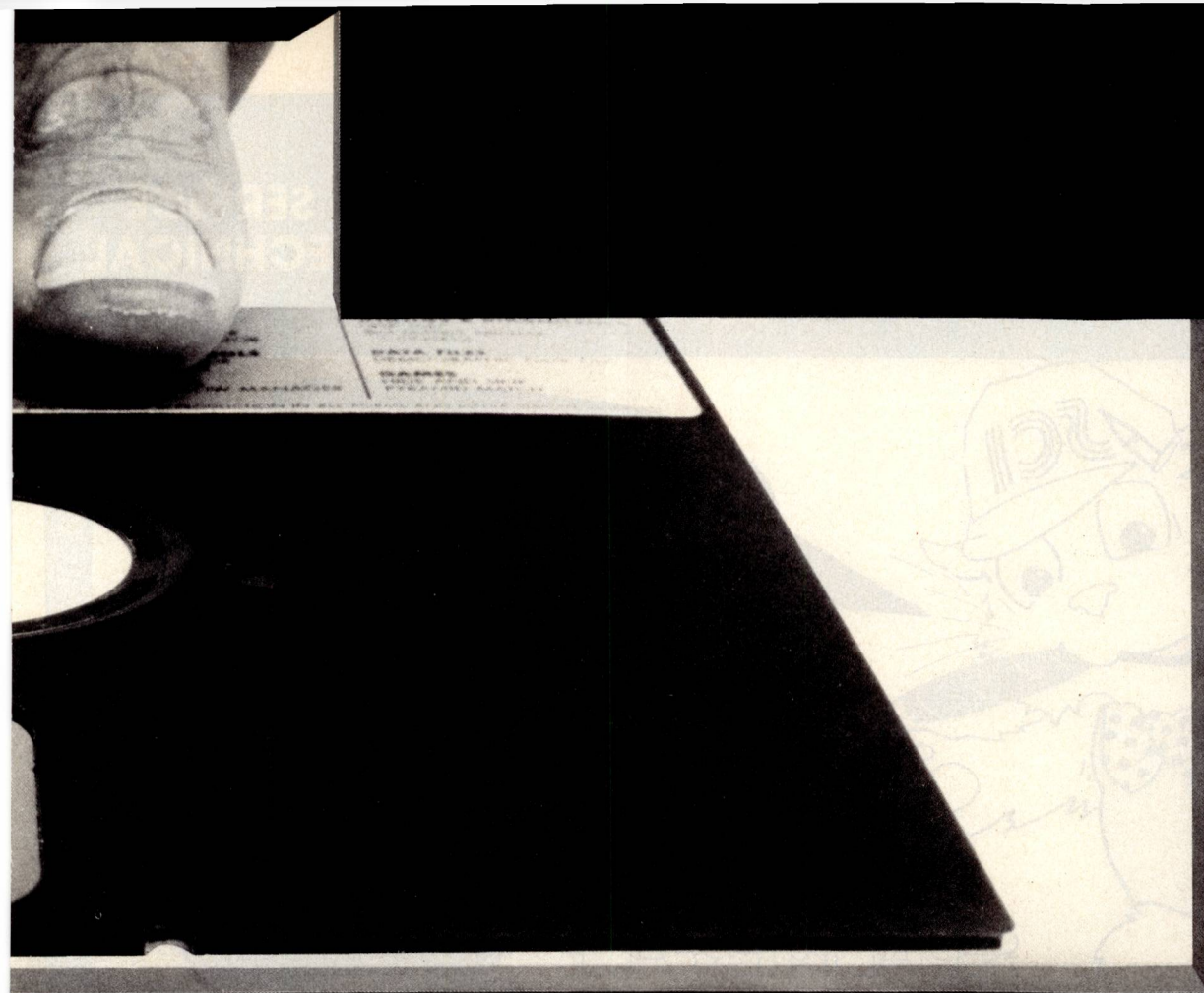
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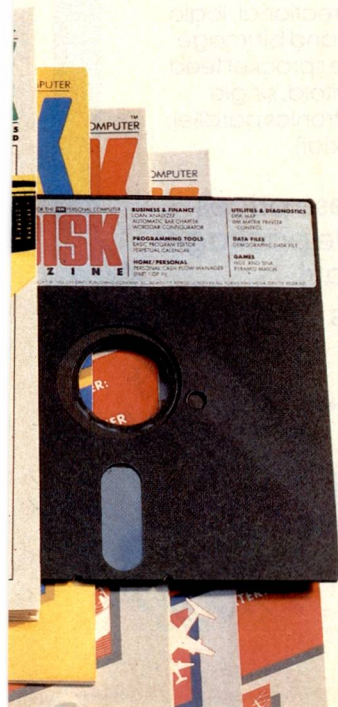
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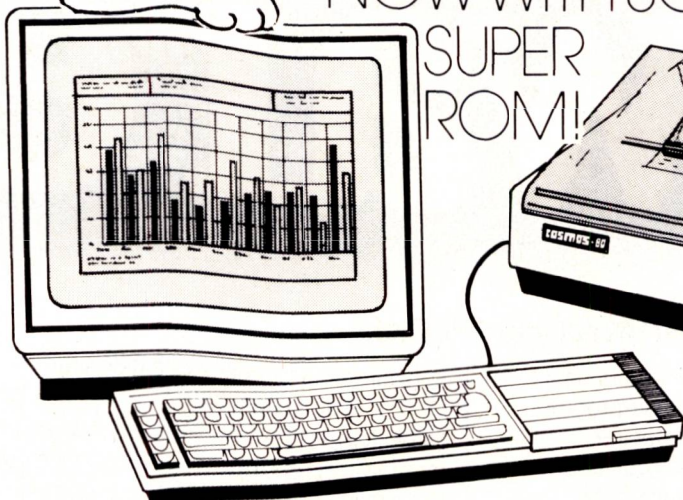


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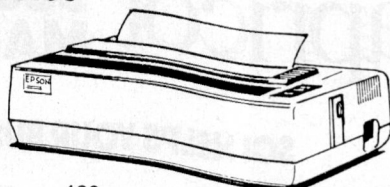
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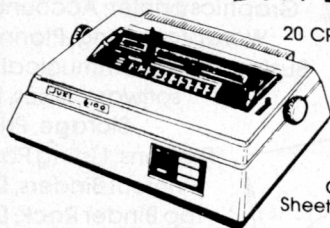
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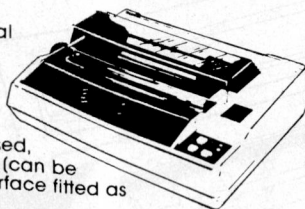
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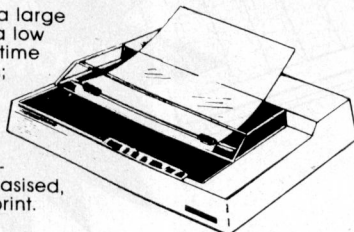
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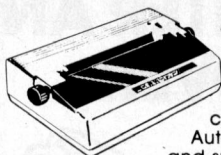


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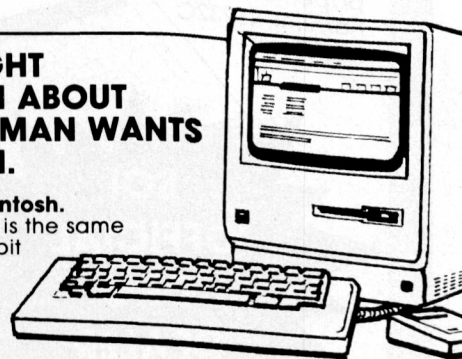
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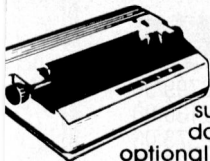
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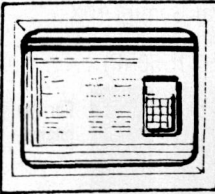
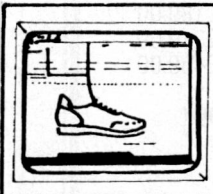
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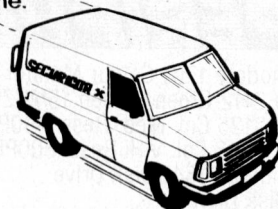
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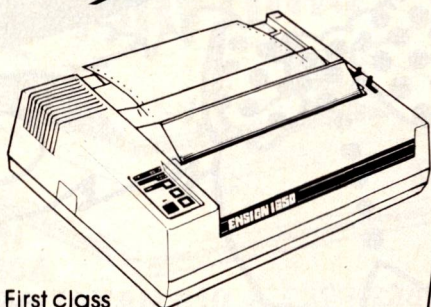


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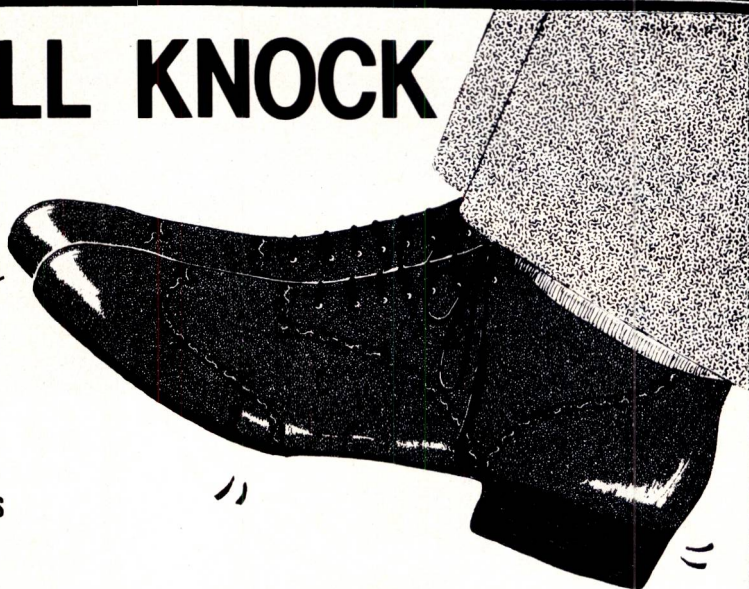
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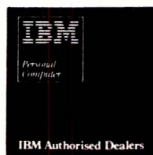


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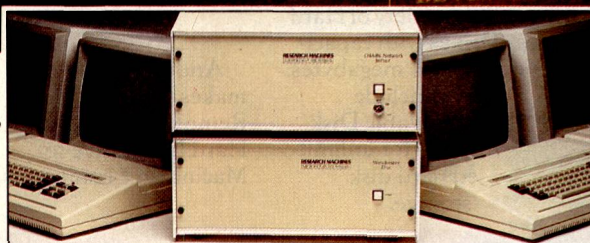
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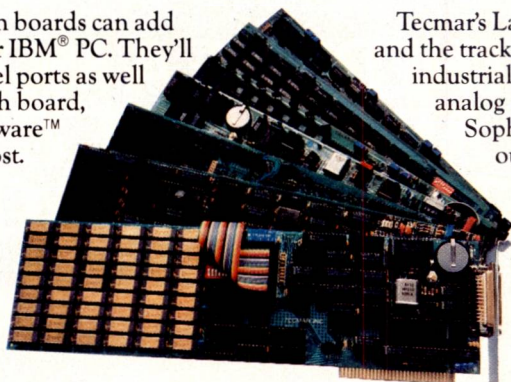


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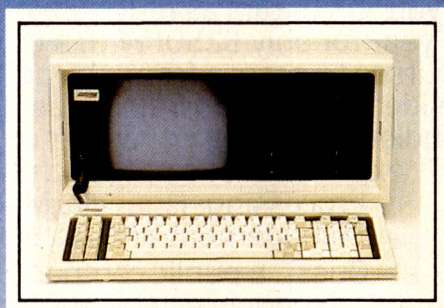
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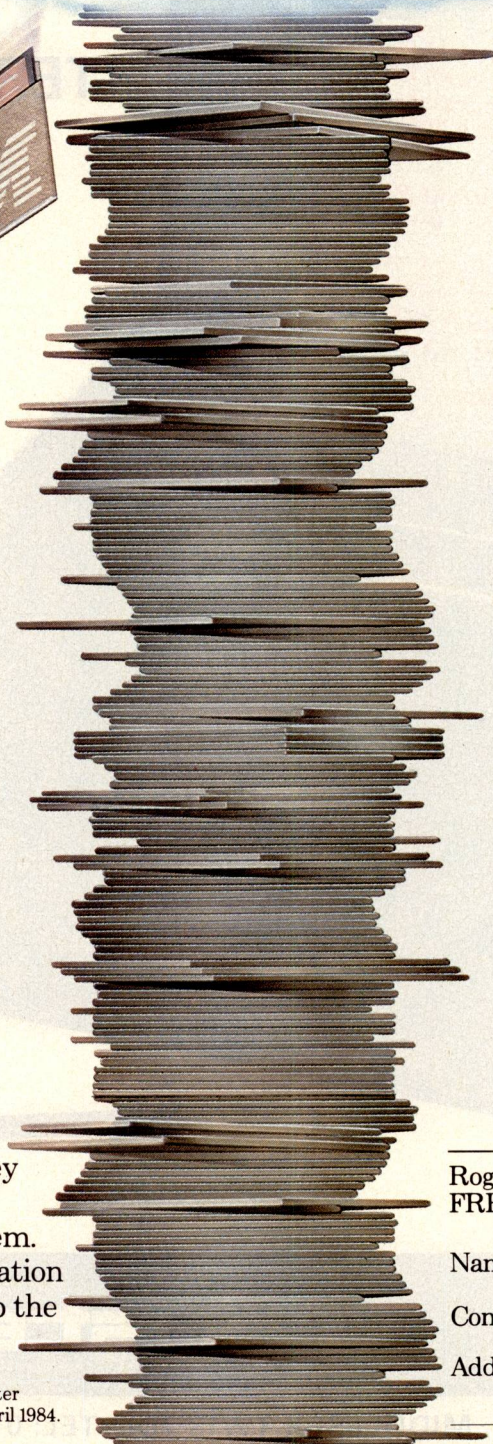
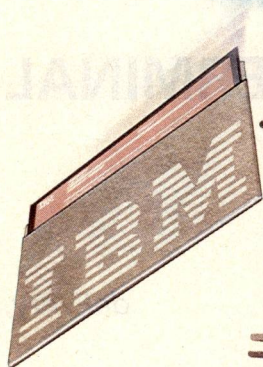
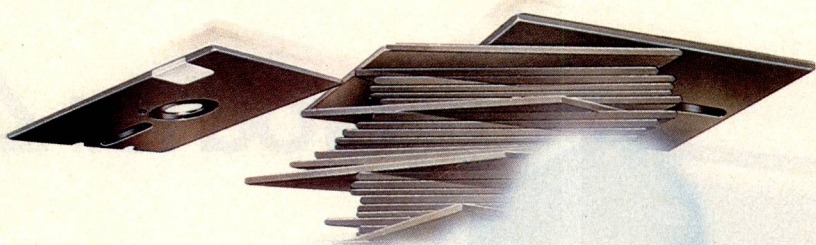
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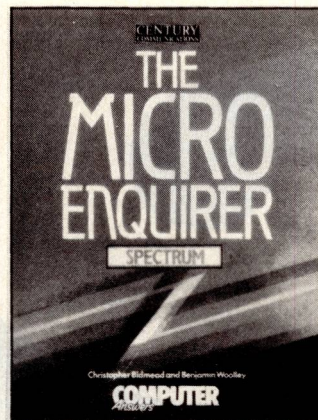
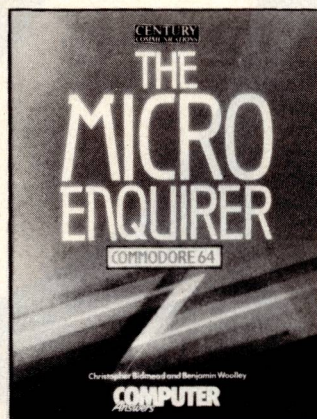
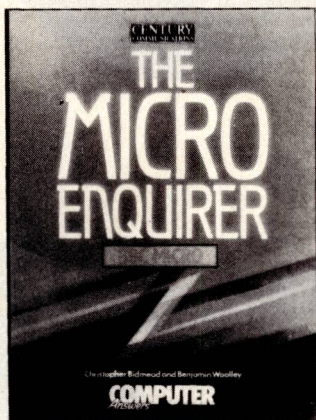
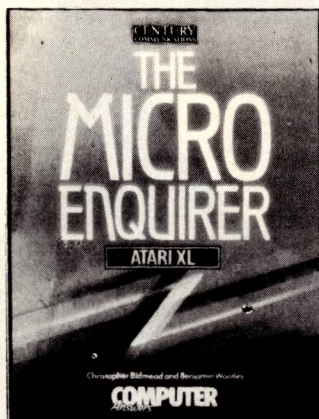
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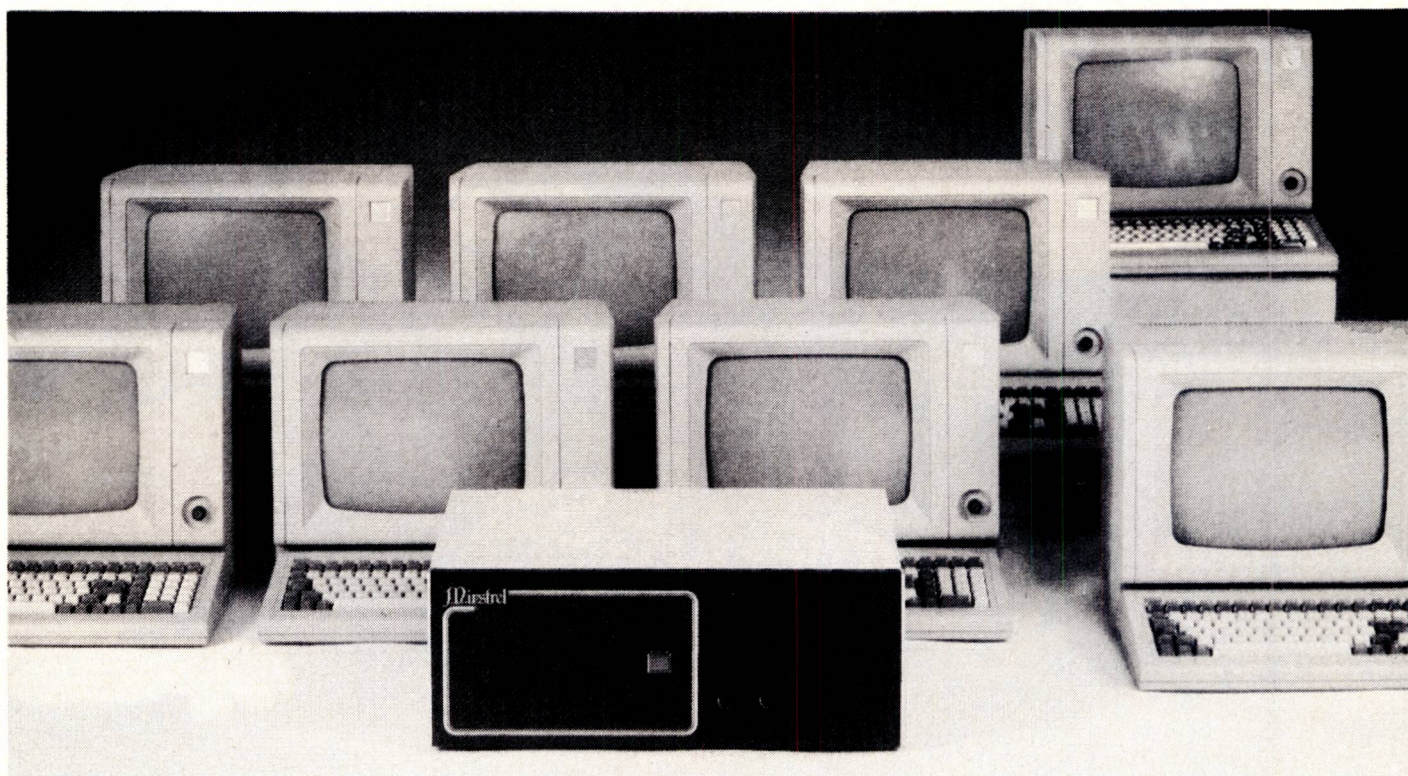
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|                                |                 |                              |         |                             |            |                                    |                         |
|--------------------------------|-----------------|------------------------------|---------|-----------------------------|------------|------------------------------------|-------------------------|
| <b>A</b>                       |                 | Disco technology             | 325/323 | London Computer Centre      | 15         | <b>S</b>                           |                         |
| Abacus Software                | 58              | Disking                      | 327/8/9 | Lotus Developments          | 112/113    | Sage Systems                       | 24/25                   |
| Acorn                          | 40/41/159       | Display Electronics          | 284     |                             |            | Sanyo                              | 320/321                 |
| ACT                            | 89/135/218/219  | Dixonian Computer Services   | 28      | <b>M</b>                    |            | SCI (UK) Ltd                       | 36/37/38/39/308/309     |
| Actel Computers                | 76              |                              |         | M-Tec                       | 262        | Seescan Devices                    | 262                     |
| Adcomp                         | 77              | <b>E</b>                     |         | Magitech                    | 256        | Select Computing                   | 100                     |
| Adder Publishing               | 123             | Electroconsult               | 275     | Mannesmann Tally            | 47         | Silica Shop                        | 17                      |
| Advanced Electronics           | 123             | Electronequip                | 333     | MAP                         | 346        | Silicon Valley                     | 289/355                 |
| Advanced Resources             | 69              |                              |         | Master Systems              | 18         | Simon Computers                    | 61                      |
| Adwell Computer Services       | 314             | <b>F</b>                     |         | Mayvision                   | 285        | Silver Reed                        | 296                     |
| Alpha Micros                   | 72/73           | Force 4 Computer Services    | 55      | Memotech                    | 106        | Smith Corona                       | 295                     |
| Altor                          | 298             | Fraser Associates            | 139     | Miracle Technology          | 67         | Societe General de Developments    | 294                     |
| Amstrad                        | 56/7            |                              |         | Microcentre                 | 98         | Softquest                          | 300                     |
| Anglia Computer Centre         | 52              | <b>G</b>                     |         | Microcosm Research          | 14         | Softsel                            | 274                     |
| Anirog                         | 338             | Gemini                       | 264/5   | Micro Discount              | 268        | Software Ltd                       | IFC                     |
| Ashton Tate                    | 71              | Gemini Marketing             | 330     | Microfast                   | 78         | Spectravideo                       | 62/63                   |
| Astar International            | 288             | Georgetown Computer Services | 294     | Micro General               | 45         | Spectrum                           | 248/9/50/51/52/53/54/55 |
| ATA Systems                    | 79              | Gevere Electronics           | 260/1   | Microft Technology          | 131/123    | Star Computers                     | 296/7                   |
| Axis                           | 301             | Globel                       | 299     | Micromanagement             | 271/2/3/82 | STC                                | 48/49                   |
| Axis                           | 316/317/318/319 | Goldcrest                    | 332     | Micromiracles               | 54         | Stirling Microsystems              | 76                      |
| <b>B</b>                       |                 | Golden Valley Computers      | 60      | Microperipherals            | 257        | Swanley Electronics                | 52                      |
| Barbian Systems                | 127             | Gould Electronics            | 300     | Micro Repair Club           | 55         | System Science                     | 332                     |
| BBC Publications               | 90              | GSL                          | 21      | Microvitec                  | 266        |                                    |                         |
| Bits And Bytes                 | 283             | <b>H</b>                     |         | Microwave                   | 311        | <b>T</b>                           |                         |
| British Olivetti               | 42/3            | H Reynolds                   | 270     | Mighty Micros               | 60         | 3D Computers                       | 307                     |
| The Byteshops                  | 280/281         | HCCS                         | 285     | MLH Technology              | 62         | Tailored Business Systems          | 157                     |
| <b>C</b>                       |                 | Hisoft                       | 276     | Modular Technology          | 35         | Tandy                              | 178                     |
| C+E Microtronics               | 300             | Home Computer Furniture Corp | 283     | Morse Computers             | 92         | Tasha Computers                    | 11/13                   |
| Cambridge Computer Store       | 288             | Homestead Electronics        | 275     | MPI                         | 162        | Tating                             | 87/193                  |
| Cambridge Micro Centre         | 173             | Homematech '84               | 76      | MX Computer Supplies        | 293        | TDI                                | 302                     |
| CCA                            | 173             | Honeywell                    | 75      | <b>N</b>                    |            | Technomatic                        | 326                     |
| Cemac                          | 277             | Hutchinsons Publishing       | 52      | NAC                         | 9          | Telesystems                        | 83                      |
| Central Micros                 | 275             |                              |         | North Herts Business Centre | 58         | Tetra Business Systems             | 74                      |
| Chestnut House                 | 269             |                              |         | Novagen                     | 50         | Thoughts + Crosses                 | 293                     |
| Citoh Electronics              | 66              | <b>I</b>                     |         | <b>O</b>                    |            | Torch Computers                    | 64/65                   |
| Comart                         | 80/81           | IBM                          | 357/8/9 | O1 Computers                | 4/5        | Touchmaster                        | 167/177/97/127          |
| Commodore                      | 184/4/5/6       | IO Research                  |         | OE Ltd                      | 336/337    | Transelect Micro Computer Services | 62                      |
| Compaq                         | 312/3/5         | IPC Magazines                | 278     | Office Equipment Marketing  | 278        | Trilex                             | 125                     |
| Comp Shop                      | 292             | Integrex                     | 306     | Opus Supplies               | 59/267/277 | <b>U</b>                           |                         |
| Computer Entrepreneur          | 78              | Intelligent Interfaces       | 316     | <b>P</b>                    |            | U Microcomputers                   | 286                     |
| Computer Peripherals & Systems | 32              | Interlex                     | 61      | P+U                         | 301        | <b>V</b>                           |                         |
| Comsoft                        | 304/305         | <b>J</b>                     |         | P+R Computer Shop           | 307        | Val Warden Consultants             | 167                     |
| Concordia                      | 77              | Jaggers                      | 177     | Parkins Assoc               | 77         | Vaser                              | 345                     |
| Crestmati                      | 84              | <b>K</b>                     |         | PAS Computer Products       | 60         | Viglen                             | 54                      |
| Cumana                         | 303             | K Bytes                      | 69      | Personal Computers          | OBC        | Vision Store                       | 70                      |
| <b>D</b>                       |                 | Keele Codes                  | 269     | Philips Austria             | 85         | VSI                                | 143                     |
| DFM                            | 58              | Kempstom Microelectronics    | 34      | Philips Business Systems    | 103        | Vulcan                             | 331                     |
| DRG Peripherals                | 95              | Keyaki                       | 279     | Pinner Wordpro              | 21         | <b>W</b>                           |                         |
| Database Publications          | 343             | Keyzone                      | 264     | Planning Consultancy        | 179        | WH Smiths                          | 164/5                   |
| Data Products                  | 322             | Kingsley Enterprises         | 262     | Power Testing Sales Ltd     | 69         | <b>X</b>                           |                         |
| Dastar                         | 275/19/21/23    | Kirklands Microware          | 276     | Practicorp                  | 51         | X-Data                             | 282                     |
| Datastore                      | 77              | Knights Computers            | 76      | Prentice Hall               | 291        | Xebec                              | 355                     |
| Dateline                       | 44              | Kuma                         | 108     | Protek Computing            | 258        | Xidex                              | 335                     |
| Davinci Computer Store         | 259             |                              |         | Psion                       | 104/5/116  | <b>Y</b>                           |                         |
| Digisolve                      | 140             | <b>L</b>                     |         | <b>R</b>                    |            | Young Electronics                  | 285                     |
| Digital Research               | 344             | Lantech Information Systems  | 283     | Radiused                    | 97         |                                    |                         |
| Digital Solutions              | IBC             | LCL                          | 167     | Rocon                       | 262        | <b>Z</b>                           |                         |
| Digitrust                      | 307             |                              |         | Romag                       | 33         | Zero Electronics                   |                         |
| Digitus                        | 1               |                              |         | Romantic Robot              | 127        |                                    |                         |
| Direct Disk Supplies           | 287             |                              |         |                             |            |                                    |                         |

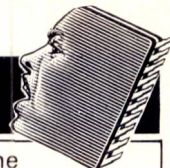
## MICROMART ADVERTISERS INDEX

[illegible]





# CHIP CHAT



**Lightweight:** buyers of keyboard cases for the Spectrum have hit on a pleasant wheeze. Once you've taken out the machine's innards and put them in a new keyboard case, take back your empty Spectrum and demand a refund because it doesn't work. The highly skilled computer sales people, so computer-literate that basics such as weight pass them by, have been known to fall for it.

**Come in number nine:** ACT's promotional material for the new Apricot Portable praises the machine's voice recognition and hi-res flat screen. However, it forgets to mention an additional feature only revealed in the

won't be competing for the prizes.

**Keep it clean:** impregnated wipes may not be the catchiest of phrases, although ChipChat is sure that they have their uses. In fact Robinsons of Chesterfield has written to assure us that they do — not just for computer hardware, but for wiping babies (no part of the anatomy specified) and cows as well (specifically, their udders).

**Nostalgia:** *Sinclair QL User* (as opposed to *QL User*, that other well-known mass circulation magazine) is so full of innovative ideas that it looks exactly like *PCW* used to.

As similarly enterprising

'can expand the ability to realise individual potential.' ChipChat thinks what he's getting at is that he enjoys using the Macintosh. But to return to Hancock's own words, these tools are of benefit to 'the new breed of achievers that this country is looking for.' ChipChat hopes that this new breed pays a bit more attention to the English language.

**Band-wagon:** the Stranglers, billed as 'the bad boys of rock', must be the oldest boys in the music business. Now they've added adventure games to their repertoire, in the form of *Aural Quest*. For all you pop-pickers, it forms part of their *Aural Sculpture* album, due to be released on 5 November.

END



*Apricot Portable: the keyboard with a difference (see 'Come in number nine')*

photograph: two rows of identical number keys. Numbers 7, 8 and 9 are the ones that get a double billing while 1, 2 and 3 never made it.

**Bright move:** British Telecom celebrated its information networking strategy, headed 'Britain should be at the forefront', by proposing a joint venture with that well-known 'British' company IBM.

ChipChat needs no reassuring about IBM's contribution to the British economy — after all, you have to invest in order to make even more money. But when called for news of the company's latest US launch, IBM UK said it was still in the dark. It's a shame that they had no money to feed the electricity meter — wonder where it could all have gone?

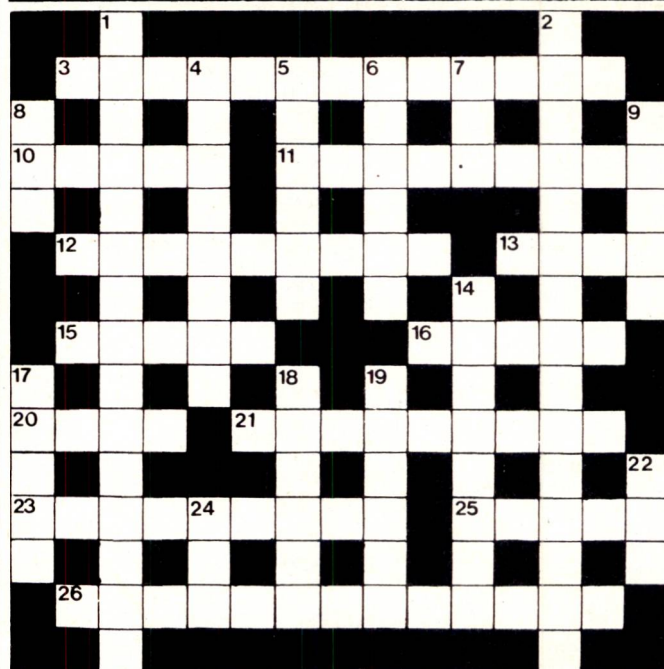
**Truth is stranger than . . .:** Martin Banks may be pondering chips for breakfast in this issue — but, as ever, Sinclair has already beaten everybody else to the crunch. Courtesy of Kellogs, 100 Spectrums are being offered as prizes on the back of cornflake packets. Breakfast being neither Martin Banks' nor ChipChat's favourite time of the day, we

advertising policy is being pursued, with the result that the magazine has a one-page ad promoting scientology. And very interesting reading the ad makes too. For example, did you know that 'a science of the mind is a goal which has engrossed thousands of generations of Man . . . and down in the arsenal is an atom bomb, its hopeful nose full-armed in ignorance of it? And would you have guessed that such phrases might form part of an 'all-embracing statement of great propensity'? You wouldn't? Shame on you.

**On your bike:** one part of the Imagine empire which has escaped publicity so far is its sponsorship of motor-bike rider Malcolm Lucas. Undeterred by the shambles elsewhere in the firm, Malcolm managed to finish the Formula 1 race at Silverstone — unfortunately he came in 22nd, or fourth from last, although 37 riders started the race.

**Mac-mouth:** 'I am my own consumer' is the proud, if confusing, declaration from David Hancock, Apple's new UK leader. What he consumes, he says, are 'personal power tools' which

## PRIZE CROSSWORD



### CLUES ACROSS

- 3 Reason for aligning text to the margin (13)
- 10 Note in nonchalant language (5)
- 11 Liveliness of moving graphics (9)
- 12 Safeguarded against writing (9)
- 13 Vulgar numerical system (4)
- 15 Quiet among buzzers, but electronic noises nevertheless (5)
- 16 Standard to improve system when up (5)
- 20 Recall from memory the sound of a little dog (4)
- 21 Peripheral paper perforator (4,5)
- 23 Do a plot in designing tape marker (4,5)
- 25 Records on the printer (5)
- 26 Count Figaro in plot to deceive the system (13)
- television, we hear (8)
- 5 Cross-channel location (6)
- 6 Misdemeanours could be perfect when wiped (6)
- 7 ASCII 84, we drink (3)
- 8 Behave like Sirius (3)
- 9 Let in a sort of chip (5)
- 14 Row about the parameter, perhaps (8)
- 17 Machine whose significance is of some gravity? (5)
- 18 Note gap in organisation of process for transfer to backing store (6)
- 19 Religious order or magnetic band? (6)
- 22 0+0=0: 0+1=0: 1+0=0: 1+1=1 (3)
- 24 Initialise pulse repetition frequency (3)

### CLUES DOWN

- 1 Vander Graaf's numerical output device? (6,9)
- 2 Rational choice (7,8)
- 4 Printing apparatus — sort of

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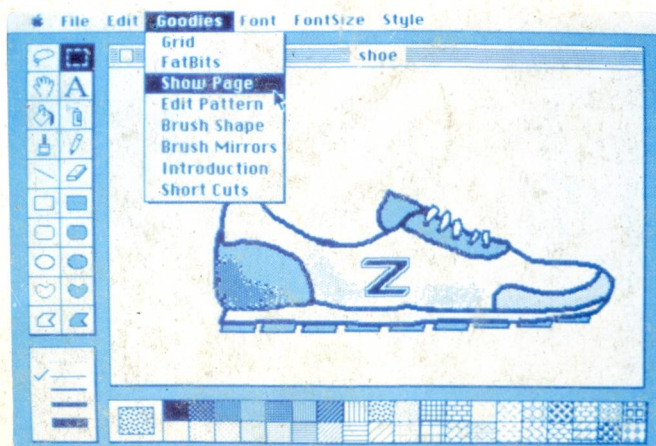
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# Apple have put your finger on it!

